



RADIO TEST REPORT

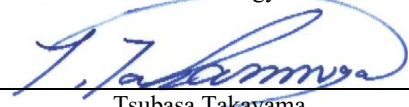
Test Report No. : 12749447H-C-R1

Applicant : Panasonic Corporation of North America
Type of Equipment : Common Trigger Box
Model No. : WV-TW37003
FCC ID : ACJ9TAWV-TW37003
Test regulation : FCC Part 15 Subpart E: 2019
For Permissive Change
(Radiated Spurious Emission tests only)
Test Result : Complied (Refer to SECTION 3.2)

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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. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12749447H-C. 12749447H-C is replaced with this report.

Date of test: June 30 and July 9, 2019

Representative test engineer: 
Junya Okuno
Engineer
Consumer Technology Division

Approved by: 
Tsubasa Takayama
Leader
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

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

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REVISION HISTORY

Original Test Report No.: 12749447H-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12749447H-C	July 30, 2019	-	-
1	12749447H-C-R1	November 8, 2019	P 6	Typing error of a) on the table in Section 3.2.
1	12749447H-C-R1	November 8, 2019	P 10	Correction of configuration and peripherals in Clause 4.2

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SECTION 1: Customer information

Applicant

Company Name	:	Panasonic Corporation of North America
Address	:	Two Riverfront Plaza, Newark, NJ 07102-5490
Telephone Number	:	+1-201-348-7724
Facsimile Number	:	+1-201-392-4564
Contact Person	:	Vir Angelo Lontoc

Manufacturer

Company Name	:	Panasonic i-PRO Sensing Solutions Co., Ltd.
Address	:	4-1-62, Minoshima, Hakata-ku, Fukuoka 812-8531, Japan
Telephone Number	:	+81-50-3380-1971
Facsimile Number	:	+81-50-3380-2002
Contact Person	:	Katsumi Yano

***Remarks:**

Panasonic Corporation of North America designates Panasonic i-PRO Sensing Solutions Co., Ltd. as manufacturer of the product (Common Trigger Box).

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	Common Trigger Box
Model No.	:	WV-TW37003
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 12 V, DC 24 V
Receipt Date of Sample (Information from test lab.)	:	June 26, 2019
Country of Mass-production	:	Japan
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab.

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2.2 Product Description

Model: WV-TW37003 (referred to as the EUT in this report) is a Common Trigger Box.

Radio Specification

Radio Type : Transceiver
Clock frequency (crystal) : 37.4 MHz

	IEEE802.11b	IEEE802.11g/n (20 M band)	IEEE802.11a/n/ac (20 M band)	IEEE802.11n/ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412 MHz to 2462 MHz	2412 MHz to 2462 MHz	5745 MHz to 5825 MHz ^{*1)}	5755 MHz ^{*1)} 5795 MHz ^{*1)}	5775 MHz ^{*1)}
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM(IEEE802.11ac only))		
Channel spacing	5MHz		20MHz	40MHz	80MHz
Antenna type	Patterned dipole antenna				
Antenna Connector type	RP-SMA Jack (Female)				
Antenna Gain	3.7 dBi (2.4 GHz Band), -4.2 dBi (5 GHz Band)				

	Bluetooth Ver.4.1 with EDR function / Bluetooth Low Energy
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	BT: FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK) LE: GFSK
Channel spacing	BT: 1 MHz LE: 2 MHz
Antenna type	Patterned dipole antenna
Antenna Connector type	RP-SMA Jack (Female)
Antenna Gain	3.7 dBi

*1) This test report applies to WLAN (5 GHz band).

*Wireless LAN and Bluetooth do not transmit simultaneously.

<Contents of the change from original model>

Specification was changed from the original model as follows:

Antenna of the EUT was modified.

The radio specification is identical to the original.

Therefore only Radiated Spurious Emission test were performed in this report.

Additionally, only the information of modified antenna is described in this report.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

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

- * The revisions made after testing date do not affect the test specification applied to the EUT.
* *The customer has declared that the EUT has complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edge	FCC: ANSI C63.10-2013 KDB Publication Number 789033	FCC: 15.407 (b), 15.205 and 15.209	3.1 dB 550.000 MHz, QP, horizontal.	Complied# a)	Conducted (< 30 MHz) / Radiated (> 30 MHz) *1)
	ISED: -	ISED: RSS-247 6.2.1.2 6.2.2.2 6.2.3.2 6.2.4.2			
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 FCC 15.407 (b) and KDB 789033 D02 G.3.b).					
a) Refer to APPENDIX 1 (data of Radiated Spurious Emission)					
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 EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage. The test was performed with DC 12.0 V by using DC power supply.
That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique coupling/antenna connector (RP-SMA Jack). Therefore the equipment complies with the requirement of 15.203.

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

3.5 Test Location

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*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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Test site	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	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	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	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	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.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
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 and also was judged the necessity of 802.11ac mode by the pre-test.

Mode	Remarks*
IEEE 802.11a (11a)	6 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 7 (Long GI), PN9
IEEE 802.11ac 20 MHz BW (11ac-20)	MCS 8 (Long GI), PN9
IEEE 802.11n 40 MHz BW (11n-40)	MCS 5 (Short GI), PN9
IEEE 802.11ac 40 MHz BW (11ac-40)	MCS 1 (Short GI), PN9
IEEE 802.11ac 80 MHz BW (11ac-80)	MCS 9 (Long GI), PN9
*The worst condition was determined based on the test result of Maximum Conducted Output Power.	
*The power value of the EUT was set for testing as follows (setting value might be different from product specification value); Power settings: Same as production model Software: TeraTerm Version4.9.2 *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 Frequency			
		Lower Band	Middle Band	Additional Band	Upper Band
Radiated Spurious Emission (Below 1 GHz)	11a Tx *1)	-	-	-	5825 MHz
Radiated Spurious Emission (Above 1 GHz)	11a Tx	-	-	-	5745 MHz
	11ac-20 Tx *2)	-	-	-	5785 MHz
	11ac-40 Tx *2)	-	-	-	5825 MHz
	11ac-80 Tx	-	-	-	5755 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *2) Since 11n-20 and 11ac-20 / 11n-40 and 11ac-40 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest output power.					

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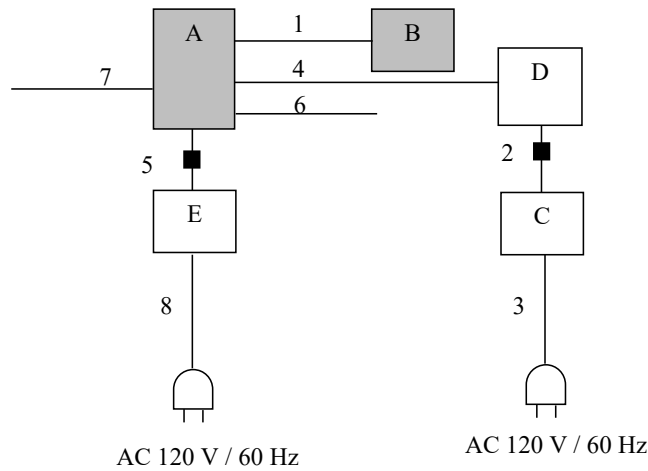
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4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Common Trigger Box	WV-TW37003	RGA0019	Panasonic i-PRO Sensing Solutions Co., Ltd.	EUT
B	Antenna	AP-PAN-W-M-S2-RP-RA-WH-15	-	Airgain	EUT
C	AC Adapter	CF-AA1653AM2	-	Panasonic	-
D	Laptop PC	CF-N8	0CKSA09265	Panasonic	-
E	AC Adapter	CF-AA1625A M4	SEB55N2-16.0C	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	4.5	Shielded	Shielded	-
2	DC Cable	1.3	Unshielded	Unshielded	-
3	AC Cable	1.8	Unshielded	Unshielded	-
4	LAN Cable	3.0	Unshielded	Unshielded	-
5	DC Cable	1.2	Unshielded	Unshielded	-
6	Flat Cable	0.7	Unshielded	Unshielded	-
7	Signal Cable	1.0	Unshielded	Unshielded	-
8	AC Cable	1.8	Unshielded	Unshielded	-

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SECTION 5: 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).

For W58 Bandedge

-27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge in the section 15.407(b)(4)(i).

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:

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

Test Antennas are used as below;

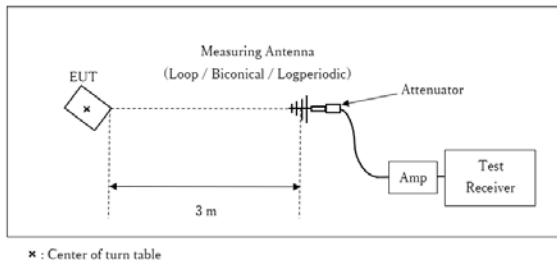
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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".

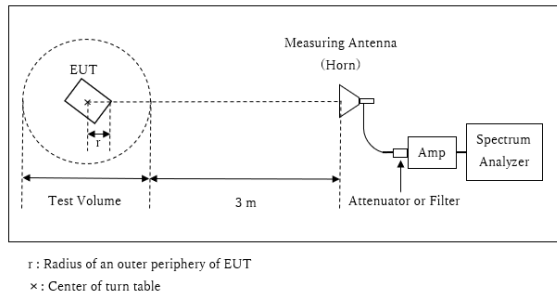
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.6 \text{ m} / 3.0 \text{ m}) = 1.59 \text{ dB}$

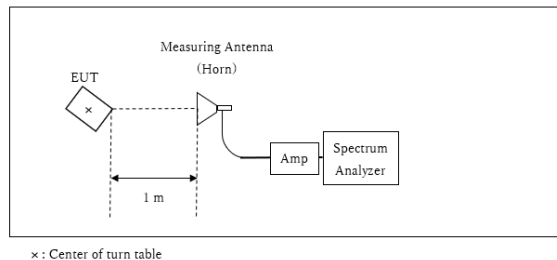
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.6 \text{ m}$

Test Volume : 1.5 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.15 \text{ m}$

10 GHz - 40.0 GHz



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 (Common Trigger Box 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 - 40 GHz
Test data	: APPENDIX
Test result	: Pass

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APPENDIX 1: Test data

Radiated Spurious Emission

Report No. 12749447H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2 No.2
Date July 9, 2019 July 9, 2019
Temperature / Humidity 22 deg. C / 60 % RH 22 deg. C / 55 % RH
Engineer Junya Okuno Koji Yamamoto
(1 GHz - 10 GHz) (10 GHz - 40 GHz)
Mode Tx 11a 5745 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.	3830.000	PK	44.0	30.1	4.9	33.5	-	45.4	73.9	28.5	
Hori.	5650.000	PK	33.3	32.1	5.6	33.3	-	37.6	68.2	30.6	
Hori.	5700.000	PK	34.9	32.2	5.6	33.3	-	39.4	105.2	65.8	
Hori.	5715.000	PK	35.0	32.2	5.6	33.3	-	39.5	109.4	69.9	
Hori.	5720.000	PK	35.1	32.2	5.6	33.3	-	39.6	110.8	71.2	
Hori.	5725.000	PK	37.4	32.2	5.6	33.3	-	41.9	122.2	80.3	
Hori.	11490.000	PK	41.7	40.4	-1.7	33.1	-	47.2	73.9	26.7	Floor noise
Hori.	17235.000	PK	43.5	40.5	-0.2	32.2	-	51.6	73.9	22.3	Floor noise
Hori.	22980.000	PK	45.0	38.6	-0.7	31.5	-	51.4	73.9	22.5	Floor noise
Hori.	3830.000	AV	35.2	30.1	4.9	33.5	0.3	36.9	53.9	17.0	
Hori.	11490.000	AV	34.4	40.4	-1.7	33.1	-	39.9	53.9	14.0	Floor noise
Hori.	17235.000	AV	35.6	40.5	-0.2	32.2	-	43.8	53.9	10.2	Floor noise
Hori.	22980.000	AV	37.4	38.6	-0.7	31.5	-	43.8	53.9	10.1	Floor noise
Vert.	3830.000	PK	46.1	30.1	4.9	33.5	-	47.5	73.9	26.4	
Vert.	5650.000	PK	33.6	32.1	5.6	33.3	-	38.0	68.2	30.2	
Vert.	5700.000	PK	35.0	32.2	5.6	33.3	-	39.5	105.2	65.7	
Vert.	5715.000	PK	37.5	32.2	5.6	33.3	-	42.0	109.4	67.4	
Vert.	5720.000	PK	40.0	32.2	5.6	33.3	-	44.4	110.8	66.4	
Vert.	5725.000	PK	44.8	32.2	5.6	33.3	-	49.3	122.2	72.9	
Vert.	11490.000	PK	41.9	40.4	-1.7	33.1	-	47.4	73.9	26.5	Floor noise
Vert.	17235.000	PK	43.7	40.5	-0.2	32.2	-	51.9	73.9	22.0	Floor noise
Vert.	22980.000	PK	44.9	38.6	-0.7	31.5	-	51.3	73.9	22.6	Floor noise
Vert.	3830.000	AV	41.4	30.1	4.9	33.5	0.3	43.1	53.9	10.8	
Vert.	11490.000	AV	34.8	40.4	-1.7	33.1	-	40.4	53.9	13.6	Floor noise
Vert.	17235.000	AV	35.6	40.5	-0.2	32.2	-	43.7	53.9	10.2	Floor noise
Vert.	22980.000	AV	37.6	38.6	-0.7	31.5	-	44.0	53.9	9.9	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 $20\log(3.6\text{ m} / 3.0\text{ m}) = 1.59\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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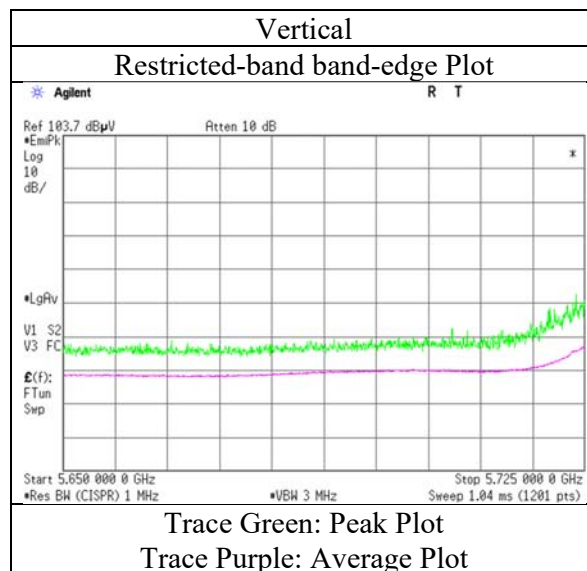
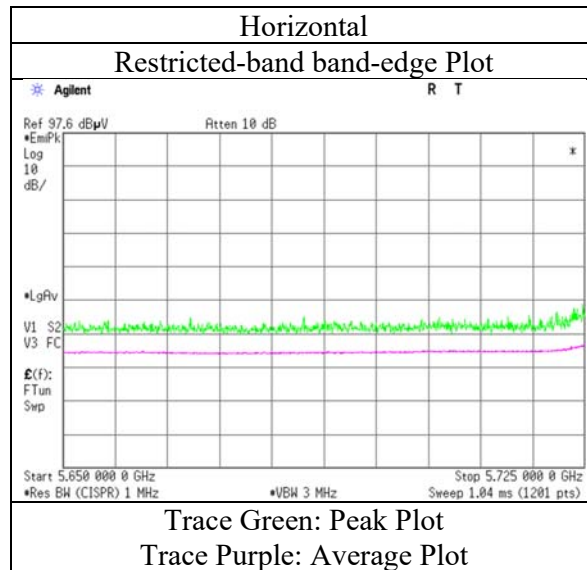
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Telephone : +81 596 24 8999

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Radiated Spurious Emission

Report No.	12749447H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	July 9, 2019
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Junya Okuno
	(1 GHz - 10 GHz)
Mode	Tx 11a 5745 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12749447H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	July 9, 2019	July 9, 2019
Temperature / Humidity	22 deg. C / 60 % RH	22 deg. C / 55 % RH
Engineer	Junya Okuno	Koji Yamamoto
	(1 GHz - 10 GHz)	(10 GHz - 40 GHz)
Mode	Tx 11a 5785 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.	3856.660	PK	44.4	30.1	4.9	33.5	-	45.9	73.9	28.0	
Hori.	11570.000	PK	41.9	40.0	-1.6	33.1	-	47.1	73.9	26.8	Floor noise
Hori.	17355.000	PK	43.9	41.2	-0.2	32.1	-	52.8	73.9	21.1	Floor noise
Hori.	23140.000	PK	45.6	38.7	-0.7	31.4	-	52.2	73.9	21.7	Floor noise
Hori.	3856.660	AV	37.0	30.1	4.9	33.5	0.3	38.7	53.9	15.2	
Hori.	11570.000	AV	34.4	40.0	-1.6	33.1	-	39.6	53.9	14.3	Floor noise
Hori.	17355.000	AV	35.3	41.2	-0.2	32.1	-	44.1	53.9	9.8	Floor noise
Hori.	23140.000	AV	37.4	38.7	-0.7	31.4	-	44.0	53.9	9.9	Floor noise
Vert.	3856.660	PK	47.1	30.1	4.9	33.5	-	48.5	73.9	25.4	
Vert.	11570.000	PK	42.1	40.0	-1.6	33.1	-	47.3	73.9	26.6	Floor noise
Vert.	17355.000	PK	44.0	41.2	-0.2	32.1	-	52.9	73.9	21.0	Floor noise
Vert.	23140.000	PK	45.6	38.7	-0.7	31.4	-	52.2	73.9	21.7	Floor noise
Vert.	3856.660	AV	42.2	30.1	4.9	33.5	0.3	44.0	53.9	9.9	
Vert.	11570.000	AV	34.2	40.0	-1.6	33.1	-	39.4	53.9	14.5	Floor noise
Vert.	17355.000	AV	35.6	41.2	-0.2	32.1	-	44.5	53.9	9.4	Floor noise
Vert.	23140.000	AV	37.5	38.7	-0.7	31.4	-	44.1	53.9	9.8	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 20log (3.6 m / 3.0 m) = 1.59 dB
 10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Ise EMC Lab.

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Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No.	12749447H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	July 9, 2019	July 9, 2019	July 13, 2019
Temperature / Humidity	22 deg. C / 60 % RH	22 deg. C / 55 % RH	23 deg. C / 70 % RH
Engineer	Junya Okuno	Koji Yamamoto	Junya Okuno
	(1 GHz - 10 GHz)	(10 GHz - 40 GHz)	(Below 1 GHz)
Mode	Tx 11a 5825 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.	62.228	QP	44.1	6.9	7.1	30.4	-	27.7	40.0	12.3	
Hori.	94.389	QP	41.3	9.1	7.4	30.3	-	27.5	43.5	16.0	
Hori.	400.001	QP	42.4	15.6	9.6	29.7	-	37.9	46.0	8.2	
Hori.	449.988	QP	39.4	16.4	9.6	29.9	-	35.5	46.0	10.5	
Hori.	499.998	QP	42.8	17.7	9.8	30.0	-	40.3	46.0	5.7	
Hori.	550.000	QP	44.9	17.9	10.0	29.9	-	42.9	46.0	3.1	
Hori.	3883.322	PK	44.7	30.1	4.9	33.5	-	46.2	73.9	27.7	
Hori.	5850.000	PK	35.8	32.5	5.6	33.3	-	40.7	122.2	81.5	
Hori.	5855.000	PK	33.9	32.5	5.6	33.3	-	38.7	110.8	72.1	
Hori.	5860.000	PK	33.3	32.5	5.6	33.3	-	38.1	109.4	71.3	
Hori.	5875.000	PK	33.7	32.5	5.6	33.3	-	38.5	105.2	66.7	
Hori.	5925.000	PK	33.6	32.5	5.7	33.3	-	38.4	68.2	29.8	
Hori.	11650.000	PK	42.2	39.6	-1.6	33.1	-	47.1	73.9	26.8	Floor noise
Hori.	17475.000	PK	44.1	42.1	-0.2	32.1	-	53.9	73.9	20.1	Floor noise
Hori.	23300.000	PK	46.0	38.8	-0.6	31.4	-	52.8	73.9	21.1	Floor noise
Hori.	3883.322	AV	38.1	30.1	4.9	33.5	0.3	39.9	53.9	14.0	
Hori.	11650.000	AV	34.3	39.6	-1.6	33.1	-	39.3	53.9	14.6	Floor noise
Hori.	17475.000	AV	35.6	42.1	-0.2	32.1	-	45.3	53.9	8.6	Floor noise
Hori.	23300.000	AV	37.6	38.8	-0.6	31.4	-	44.4	53.9	9.5	Floor noise
Vert.	62.229	QP	49.0	6.9	7.1	30.4	-	32.6	40.0	7.4	
Vert.	96.328	QP	48.0	9.5	7.4	30.3	-	34.6	43.5	8.9	
Vert.	399.999	QP	35.5	15.6	9.6	29.7	-	31.0	46.0	15.1	
Vert.	449.998	QP	31.8	16.4	9.6	29.9	-	28.0	46.0	18.1	
Vert.	500.000	QP	39.7	17.7	9.8	30.0	-	37.2	46.0	8.8	
Vert.	550.002	QP	41.7	17.9	10.0	29.8	-	39.7	46.0	6.3	
Vert.	3883.322	PK	46.2	30.1	4.9	33.5	-	47.7	73.9	26.2	
Vert.	5850.000	PK	39.5	32.5	5.6	33.3	-	44.4	122.2	77.8	
Vert.	5855.000	PK	37.5	32.5	5.6	33.3	-	42.3	110.8	68.5	
Vert.	5860.000	PK	36.1	32.5	5.6	33.3	-	40.9	109.4	68.5	
Vert.	5875.000	PK	33.3	32.5	5.6	33.3	-	38.1	105.2	67.1	
Vert.	5925.000	PK	33.3	32.5	5.7	33.3	-	38.1	68.2	30.1	
Vert.	11650.000	PK	42.1	39.6	-1.6	33.1	-	47.1	73.9	26.8	Floor noise
Vert.	17475.000	PK	43.8	42.1	-0.2	32.1	-	53.6	73.9	20.3	Floor noise
Vert.	23300.000	PK	46.1	38.8	-0.6	31.4	-	52.9	73.9	21.0	Floor noise
Vert.	3883.322	AV	42.1	30.1	4.9	33.5	0.3	43.9	53.9	10.0	
Vert.	11650.000	AV	34.3	39.6	-1.6	33.1	-	39.2	53.9	14.7	Floor noise
Vert.	17475.000	AV	35.1	42.1	-0.2	32.1	-	44.9	53.9	9.0	Floor noise
Vert.	23300.000	AV	37.6	38.8	-0.6	31.4	-	44.4	53.9	9.5	Floor noise

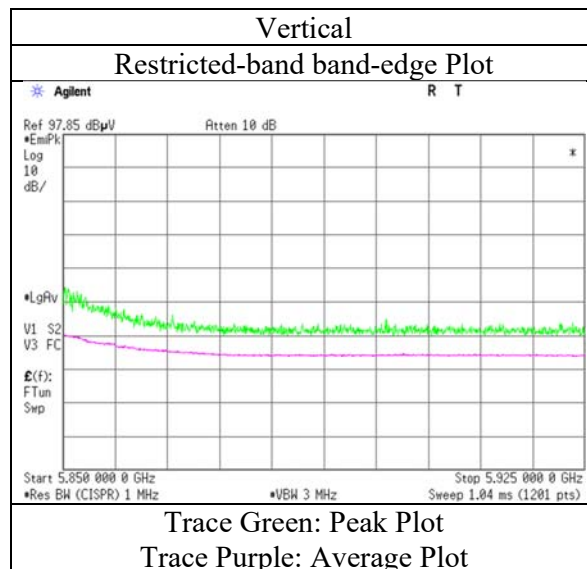
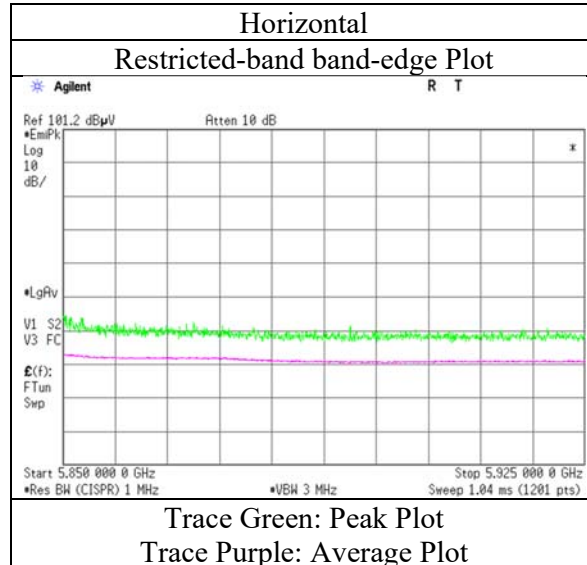
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz 20log (3.6 m / 3.0 m) = 1.59 dB
 10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12749447H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	July 9, 2019
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Junya Okuno
Mode	Tx 11a 5825 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No. 12749447H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 30, 2019 No.2
Temperature / Humidity 25 deg. C / 57 % RH July 9, 2019
Engineer Koji Yamamoto 22 deg. C / 55 % RH
(1 GHz - 10 GHz) Koji Yamamoto
(10 GHz - 40 GHz)
Mode Tx 11ac-20 5745 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.	1040.000	PK	49.3	25.5	3.3	35.4	-	42.7	73.9	31.2	
Hori.	1665.963	PK	48.4	25.3	3.7	34.7	-	42.6	73.9	31.3	
Hori.	3829.988	PK	43.3	30.1	4.9	33.5	-	44.7	73.9	29.2	
Hori.	5650.000	PK	41.9	32.1	5.6	33.3	-	46.2	68.2	22.0	
Hori.	5700.000	PK	41.1	32.2	5.6	33.3	-	45.5	105.2	59.7	
Hori.	5715.000	PK	42.4	32.2	5.6	33.3	-	46.8	109.4	62.6	
Hori.	5720.000	PK	44.3	32.2	5.6	33.3	-	48.7	110.8	62.1	
Hori.	5725.000	PK	42.7	32.2	5.6	33.3	-	47.2	122.2	75.0	
Hori.	11490.000	PK	42.1	40.4	-1.7	33.1	-	47.7	73.9	26.2	Floor noise
Hori.	17235.000	PK	44.1	40.5	-0.2	32.2	-	52.2	73.9	21.7	Floor noise
Hori.	22980.000	PK	44.4	38.6	-0.7	31.5	-	50.8	73.9	23.1	Floor noise
Hori.	1040.000	AV	42.8	25.5	3.3	35.4	-	36.2	53.9	17.7	
Hori.	1665.963	AV	36.7	25.3	3.7	34.7	-	31.0	53.9	22.9	
Hori.	3829.988	AV	36.3	30.1	4.9	33.5	2.2	40.0	53.9	13.9	
Hori.	11490.000	AV	34.7	40.4	-1.7	33.1	-	40.3	53.9	13.6	Floor noise
Hori.	17235.000	AV	35.7	40.5	-0.2	32.2	-	43.8	53.9	10.1	Floor noise
Hori.	22980.000	AV	37.3	38.6	-0.7	31.5	-	43.7	53.9	10.2	Floor noise
Vert.	1040.000	PK	48.3	25.5	3.3	35.4	-	41.7	73.9	32.2	
Vert.	1665.963	PK	45.9	25.3	3.7	34.7	-	40.1	73.9	33.8	
Vert.	3831.028	PK	44.0	30.1	4.9	33.5	-	45.4	73.9	28.5	
Vert.	5650.000	PK	42.1	32.1	5.6	33.3	-	46.5	68.2	21.7	
Vert.	5700.000	PK	43.3	32.2	5.6	33.3	-	47.8	105.2	57.4	
Vert.	5715.000	PK	41.9	32.2	5.6	33.3	-	46.4	109.4	63.0	
Vert.	5720.000	PK	42.3	32.2	5.6	33.3	-	46.8	110.8	64.0	
Vert.	5725.000	PK	42.5	32.2	5.6	33.3	-	47.0	122.2	75.2	
Vert.	11490.000	PK	42.6	40.4	-1.7	33.1	-	48.1	73.9	25.8	Floor noise
Vert.	17235.000	PK	43.8	40.5	-0.2	32.2	-	51.9	73.9	22.0	Floor noise
Vert.	22980.000	PK	44.5	38.6	-0.7	31.5	-	50.9	73.9	23.0	Floor noise
Vert.	1040.000	AV	40.4	25.5	3.3	35.4	-	33.8	53.9	20.1	
Vert.	1665.963	AV	36.2	25.3	3.7	34.7	-	30.5	53.9	23.4	
Vert.	3831.028	AV	37.1	30.1	4.9	33.5	2.2	40.8	53.9	13.1	
Vert.	11490.000	AV	34.5	40.4	-1.7	33.1	-	40.1	53.9	13.8	Floor noise
Vert.	17235.000	AV	35.8	40.5	-0.2	32.2	-	44.0	53.9	9.9	Floor noise
Vert.	22980.000	AV	37.4	38.6	-0.7	31.5	-	43.8	53.9	10.1	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 $20\log(3.6\text{ m} / 3.0\text{ m}) = 1.59\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Ise EMC Lab.

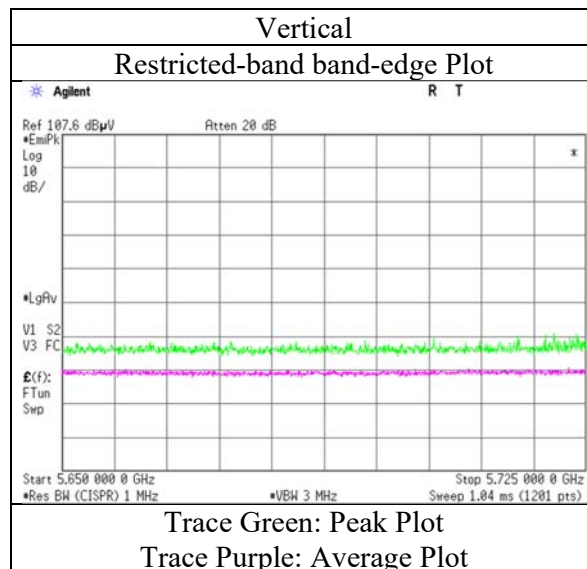
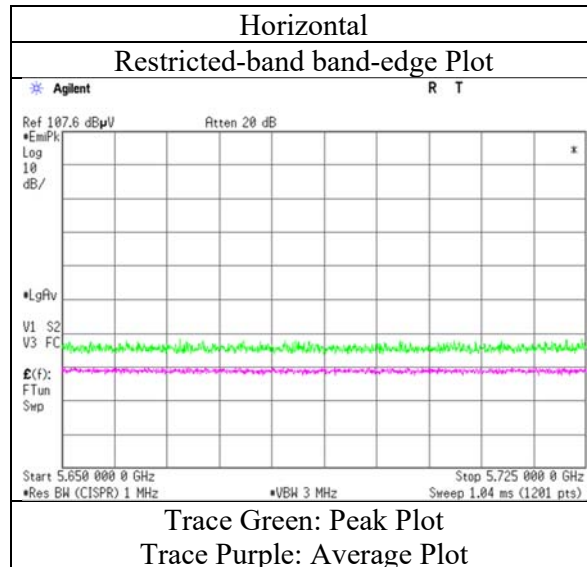
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Radiated Spurious Emission

Report No.	12749447H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 30, 2019
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Koji Yamamoto
Mode	Tx 11ac-20 5745 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
 Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No. 12749447H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 30, 2019 No.2
Temperature / Humidity 25 deg. C / 57 % RH 22 deg. C / 55 % RH
Engineer Koji Yamamoto Koji Yamamoto
(1 GHz - 10 GHz) (10 GHz - 40 GHz)
Mode Tx 11ac-20 5785 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.	1040.000	PK	49.4	25.5	3.3	35.4	-	42.8	73.9	31.1	
Hori.	1665.424	PK	51.9	25.3	3.7	34.7	-	46.2	73.9	27.8	
Hori.	3855.073	PK	43.8	30.1	4.9	33.5	-	45.3	73.9	28.6	
Hori.	11570.000	PK	42.0	40.0	-1.6	33.1	-	47.3	73.9	26.6	Floor noise
Hori.	17355.000	PK	43.2	41.2	-0.2	32.1	-	52.1	73.9	21.8	Floor noise
Hori.	23140.000	PK	45.5	38.7	-0.7	31.4	-	52.1	73.9	21.8	Floor noise
Hori.	1040.000	AV	43.8	25.5	3.3	35.4	-	37.2	53.9	16.7	
Hori.	1665.424	AV	37.9	25.3	3.7	34.7	-	32.2	53.9	21.8	
Hori.	3855.073	AV	38.2	30.1	4.9	33.5	2.2	41.9	53.9	12.0	
Hori.	11570.000	AV	34.3	40.0	-1.6	33.1	-	39.5	53.9	14.4	Floor noise
Hori.	17355.000	AV	35.3	41.2	-0.2	32.1	-	44.2	53.9	9.7	Floor noise
Hori.	23140.000	AV	37.5	38.7	-0.7	31.4	-	44.2	53.9	9.7	Floor noise
Vert.	1040.000	PK	47.4	25.5	3.3	35.4	-	40.8	73.9	33.1	
Vert.	1665.424	PK	44.8	25.3	3.7	34.7	-	39.1	73.9	34.9	
Vert.	3855.073	PK	44.2	30.1	4.9	33.5	-	45.7	73.9	28.2	
Vert.	11570.000	PK	42.2	40.0	-1.6	33.1	-	47.4	73.9	26.5	Floor noise
Vert.	17355.000	PK	43.9	41.2	-0.2	32.1	-	52.7	73.9	21.2	Floor noise
Vert.	23140.000	PK	45.6	38.7	-0.7	31.4	-	52.2	73.9	21.7	Floor noise
Vert.	1040.000	AV	39.7	25.5	3.3	35.4	-	33.1	53.9	20.8	
Vert.	1665.424	AV	36.2	25.3	3.7	34.7	-	30.5	53.9	23.5	
Vert.	3855.073	AV	37.3	30.1	4.9	33.5	2.2	41.0	53.9	12.9	
Vert.	11570.000	AV	34.4	40.0	-1.6	33.1	-	39.6	53.9	14.3	Floor noise
Vert.	17355.000	AV	35.5	41.2	-0.2	32.1	-	44.4	53.9	9.5	Floor noise
Vert.	23140.000	AV	37.4	38.7	-0.7	31.4	-	44.0	53.9	9.9	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 $20\log(3.6\text{ m} / 3.0\text{ m}) = 1.59\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 12749447H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 30, 2019 No.2
Temperature / Humidity 25 deg. C / 57 % RH July 9, 2019
Engineer Koji Yamamoto 22 deg. C / 55 % RH
(1 GHz - 10 GHz) Koji Yamamoto
(10 GHz - 40 GHz)
Mode Tx 11ac-20 5825 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.	1037.115	PK	50.1	25.4	3.3	35.4	-	43.4	73.9	30.5	
Hori.	1665.627	PK	53.1	25.3	3.7	34.7	-	47.4	73.9	26.5	
Hori.	3886.137	PK	43.4	30.1	4.9	33.5	-	44.9	73.9	29.0	
Hori.	5850.000	PK	42.3	32.5	5.6	33.3	-	47.2	122.2	75.0	
Hori.	5855.000	PK	41.2	32.5	5.6	33.3	-	46.1	110.8	64.7	
Hori.	5860.000	PK	42.0	32.5	5.6	33.3	-	46.9	109.4	62.5	
Hori.	5875.000	PK	41.5	32.5	5.6	33.3	-	46.3	105.2	58.9	
Hori.	5925.000	PK	42.4	32.5	5.7	33.3	-	47.2	68.2	21.0	
Hori.	11650.000	PK	41.7	39.6	-1.6	33.1	-	46.6	73.9	27.3	Floor noise
Hori.	17475.000	PK	43.5	42.1	-0.2	32.1	-	53.3	73.9	20.6	Floor noise
Hori.	23300.000	PK	45.9	38.8	-0.6	31.4	-	52.7	73.9	21.2	Floor noise
Hori.	1037.115	AV	44.6	25.4	3.3	35.4	-	37.9	53.9	16.1	
Hori.	1665.627	AV	38.6	25.3	3.7	34.7	-	32.8	53.9	21.1	
Hori.	3886.137	AV	37.2	30.1	4.9	33.5	2.2	41.0	53.9	12.9	
Hori.	11650.000	AV	35.3	39.6	-1.6	33.1	-	40.2	53.9	13.7	Floor noise
Hori.	17475.000	AV	35.4	42.1	-0.2	32.1	-	45.1	53.9	8.8	Floor noise
Hori.	23300.000	AV	37.8	38.8	-0.6	31.4	-	44.6	53.9	9.3	Floor noise
Vert.	1037.115	PK	47.5	25.4	3.3	35.4	-	40.8	73.9	33.1	
Vert.	1665.627	PK	46.2	25.3	3.7	34.7	-	40.4	73.9	33.5	
Vert.	3886.137	PK	44.2	30.1	4.9	33.5	-	45.7	73.9	28.2	
Vert.	5850.000	PK	41.9	32.5	5.6	33.3	-	46.7	122.2	75.5	
Vert.	5855.000	PK	42.6	32.5	5.6	33.3	-	47.4	110.8	63.4	
Vert.	5860.000	PK	41.2	32.5	5.6	33.3	-	46.0	109.4	63.4	
Vert.	5875.000	PK	41.6	32.5	5.6	33.3	-	46.5	105.2	58.7	
Vert.	5925.000	PK	55.8	32.5	5.7	33.3	-	60.6	68.2	7.6	
Vert.	11650.000	PK	42.1	39.6	-1.6	33.1	-	47.0	73.9	26.9	Floor noise
Vert.	17475.000	PK	43.4	42.1	-0.2	32.1	-	53.2	73.9	20.8	Floor noise
Vert.	23300.000	PK	46.1	38.8	-0.6	31.4	-	52.9	73.9	21.0	Floor noise
Vert.	1037.115	AV	39.7	25.4	3.3	35.4	-	32.9	53.9	21.0	
Vert.	1665.627	AV	36.4	25.3	3.7	34.7	-	30.6	53.9	23.3	
Vert.	3886.137	AV	37.3	30.1	4.9	33.5	2.2	41.1	53.9	12.9	
Vert.	11650.000	AV	35.0	39.6	-1.6	33.1	-	40.0	53.9	13.9	Floor noise
Vert.	17475.000	AV	35.2	42.1	-0.2	32.1	-	44.9	53.9	9.0	Floor noise
Vert.	23300.000	AV	37.9	38.8	-0.6	31.4	-	44.7	53.9	9.2	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 $20\log(3.6\text{ m} / 3.0\text{ m}) = 1.59\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

UL Japan, Inc.

Ise EMC Lab.

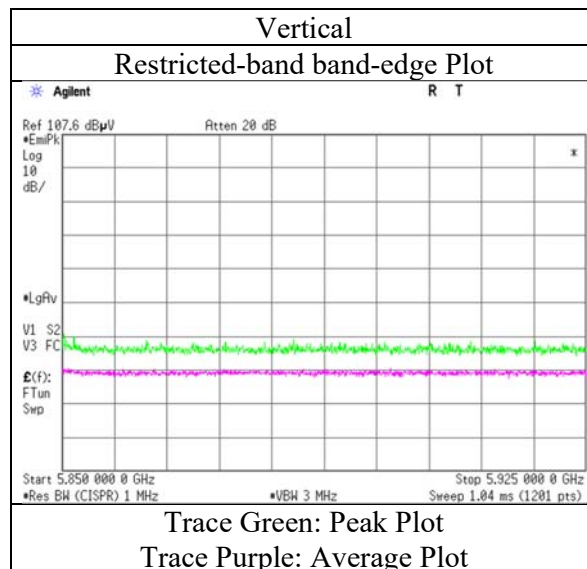
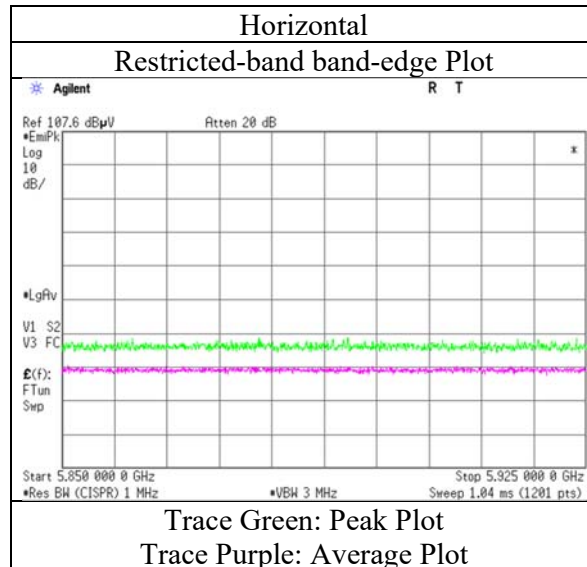
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No.	12749447H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 30, 2019
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Koji Yamamoto
Mode	Tx 11ac-20 5825 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
 Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No. 12749447H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 30, 2019 No.2
Temperature / Humidity 25 deg. C / 57 % RH 22 deg. C / 55 % RH
Engineer Koji Yamamoto Koji Yamamoto
(1 GHz - 10 GHz) (10 GHz - 40 GHz)
Mode Tx 11ac-40 5755 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.	1040.000	PK	50.7	25.5	3.3	35.4	-	44.1	73.9	29.8	
Hori.	1664.508	PK	52.6	25.3	3.7	34.7	-	46.9	73.9	27.0	
Hori.	3836.660	PK	42.7	30.1	4.9	33.5	-	44.2	73.9	29.8	
Hori.	5650.000	PK	42.5	32.1	5.6	33.3	-	46.9	68.2	21.4	
Hori.	5700.000	PK	46.8	32.2	5.6	33.3	-	51.3	105.2	53.9	
Hori.	5715.000	PK	51.7	32.2	5.6	33.3	-	56.2	109.4	53.2	
Hori.	5720.000	PK	50.3	32.2	5.6	33.3	-	54.8	110.8	56.0	
Hori.	5725.000	PK	49.9	32.2	5.6	33.3	-	54.4	122.2	67.8	
Hori.	11510.000	PK	42.5	40.3	-1.7	33.1	-	48.1	73.9	25.9	Floor noise
Hori.	17265.000	PK	44.0	40.6	-0.2	32.2	-	52.3	73.9	21.7	Floor noise
Hori.	23020.000	PK	45.2	38.7	-0.7	31.5	-	51.7	73.9	22.2	Floor noise
Hori.	1040.000	AV	44.4	25.5	3.3	35.4	-	37.8	53.9	16.1	
Hori.	1664.508	AV	38.3	25.3	3.7	34.7	-	32.5	53.9	21.4	
Hori.	3836.660	AV	37.5	30.1	4.9	33.5	1.2	40.2	53.9	13.7	
Hori.	11510.000	AV	34.4	40.3	-1.7	33.1	-	39.9	53.9	14.0	Floor noise
Hori.	17265.000	AV	35.7	40.6	-0.2	32.2	-	43.9	53.9	10.0	Floor noise
Hori.	23020.000	AV	37.7	38.7	-0.7	31.5	-	44.1	53.9	9.8	Floor noise
Vert.	1040.000	PK	47.9	25.5	3.3	35.4	-	41.3	73.9	32.6	
Vert.	1664.508	PK	45.1	25.3	3.7	34.7	-	39.4	73.9	34.6	
Vert.	3836.660	PK	43.8	30.1	4.9	33.5	-	45.3	73.9	28.6	
Vert.	5650.000	PK	41.7	32.1	5.6	33.3	-	46.0	68.2	22.2	
Vert.	5700.000	PK	44.7	32.2	5.6	33.3	-	49.1	105.2	56.1	
Vert.	5715.000	PK	48.4	32.2	5.6	33.3	-	52.9	109.4	56.5	
Vert.	5720.000	PK	50.9	32.2	5.6	33.3	-	55.3	110.8	55.5	
Vert.	5725.000	PK	51.8	32.2	5.6	33.3	-	56.3	122.2	65.9	
Vert.	11510.000	PK	42.3	40.3	-1.7	33.1	-	47.8	73.9	26.1	Floor noise
Vert.	17265.000	PK	43.6	40.6	-0.2	32.2	-	51.8	73.9	22.1	Floor noise
Vert.	23020.000	PK	45.6	38.7	-0.7	31.5	-	52.1	73.9	21.8	Floor noise
Vert.	1040.000	AV	39.9	25.5	3.3	35.4	-	33.3	53.9	20.6	
Vert.	1664.508	AV	36.6	25.3	3.7	34.7	-	30.8	53.9	23.1	
Vert.	3836.660	AV	37.1	30.1	4.9	33.5	1.2	39.8	53.9	14.2	
Vert.	11510.000	AV	34.6	40.3	-1.7	33.1	-	40.1	53.9	13.8	Floor noise
Vert.	17265.000	AV	35.1	40.6	-0.2	32.2	-	43.4	53.9	10.5	Floor noise
Vert.	23020.000	AV	37.6	38.7	-0.7	31.5	-	44.0	53.9	9.9	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 20log (3.6 m / 3.0 m) = 1.59 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Ise EMC Lab.

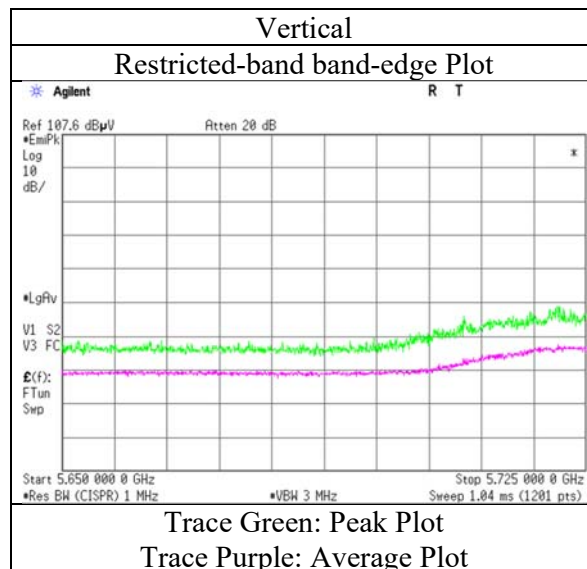
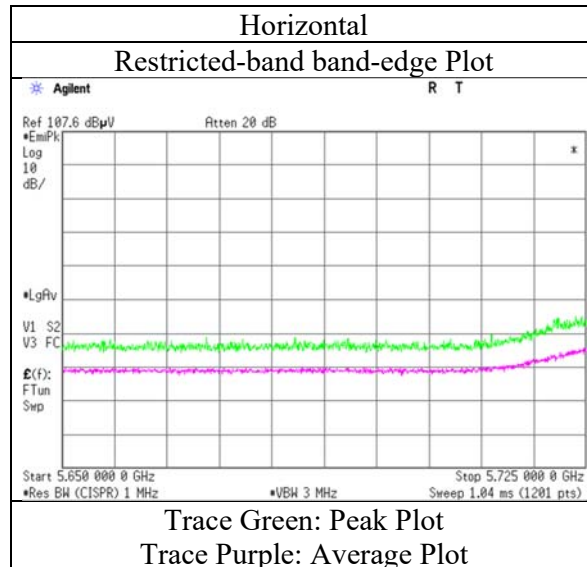
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No.	12749447H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 30, 2019
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Koji Yamamoto
Mode	Tx 11ac-40 5755 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No. 12749447H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 30, 2019 No.2
Temperature / Humidity 25 deg. C / 57 % RH 22 deg. C / 55 % RH
Engineer Koji Yamamoto Koji Yamamoto
(1 GHz - 10 GHz) (10 GHz - 40 GHz)
Mode Tx 11ac-40 5795 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.	1674.670	PK	43.9	25.4	3.7	34.7	-	38.3	73.9	35.6	
Hori.	3849.000	PK	41.5	30.1	4.9	33.5	-	43.0	73.9	30.9	
Hori.	5850.000	PK	41.3	32.5	5.6	33.3	-	46.1	122.2	76.1	
Hori.	5855.000	PK	40.1	32.5	5.6	33.3	-	44.9	110.8	65.9	
Hori.	5860.000	PK	39.2	32.5	5.6	33.3	-	44.1	109.4	65.3	
Hori.	5875.000	PK	40.7	32.5	5.6	33.3	-	45.5	105.2	59.7	
Hori.	5925.000	PK	40.7	32.5	5.7	33.3	-	45.6	68.2	22.7	
Hori.	11590.000	PK	42.5	39.9	-1.6	33.1	-	47.7	73.9	26.2	Floor noise
Hori.	17385.000	PK	43.4	41.5	-0.2	32.1	-	52.5	73.9	21.4	Floor noise
Hori.	23180.000	PK	45.7	38.8	-0.7	31.4	-	52.3	73.9	21.6	Floor noise
Hori.	1674.670	AV	36.6	25.4	3.7	34.7	-	31.0	53.9	23.0	
Hori.	3849.000	AV	34.7	30.1	4.9	33.5	1.2	37.3	53.9	16.6	
Hori.	11590.000	AV	34.6	39.9	-1.6	33.1	-	39.7	53.9	14.2	Floor noise
Hori.	17385.000	AV	35.6	41.5	-0.2	32.1	-	44.7	53.9	9.2	Floor noise
Hori.	23180.000	AV	37.5	38.8	-0.7	31.4	-	44.2	53.9	9.7	Floor noise
Vert.	1674.670	PK	53.2	25.4	3.7	34.7	-	47.6	73.9	26.3	
Vert.	3849.944	PK	44.4	30.1	4.9	33.5	-	45.8	73.9	28.1	
Vert.	5850.000	PK	43.2	32.5	5.6	33.3	-	48.1	122.2	74.1	
Vert.	5855.000	PK	40.7	32.5	5.6	33.3	-	45.6	110.8	65.2	
Vert.	5860.000	PK	40.8	32.5	5.6	33.3	-	45.7	109.4	63.7	
Vert.	5875.000	PK	40.9	32.5	5.6	33.3	-	45.7	105.2	59.5	
Vert.	5925.000	PK	41.5	32.5	5.7	33.3	-	46.3	68.2	21.9	
Vert.	11590.000	PK	42.6	39.9	-1.6	33.1	-	47.8	73.9	26.1	Floor noise
Vert.	17385.000	PK	43.3	41.5	-0.2	32.1	-	52.4	73.9	21.5	Floor noise
Vert.	23180.000	PK	45.9	38.8	-0.7	31.4	-	52.6	73.9	21.3	Floor noise
Vert.	1674.670	AV	38.1	25.4	3.7	34.7	-	32.5	53.9	21.4	
Vert.	3849.944	AV	36.4	30.1	4.9	33.5	1.2	39.0	53.9	14.9	
Vert.	11590.000	AV	34.7	39.9	-1.6	33.1	-	39.9	53.9	14.0	Floor noise
Vert.	17385.000	AV	35.6	41.5	-0.2	32.1	-	44.8	53.9	9.1	Floor noise
Vert.	23180.000	AV	37.3	38.8	-0.7	31.4	-	43.9	53.9	10.0	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 (3.6 m / 3.0 m) = 1.59 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

UL Japan, Inc.

Ise EMC Lab.

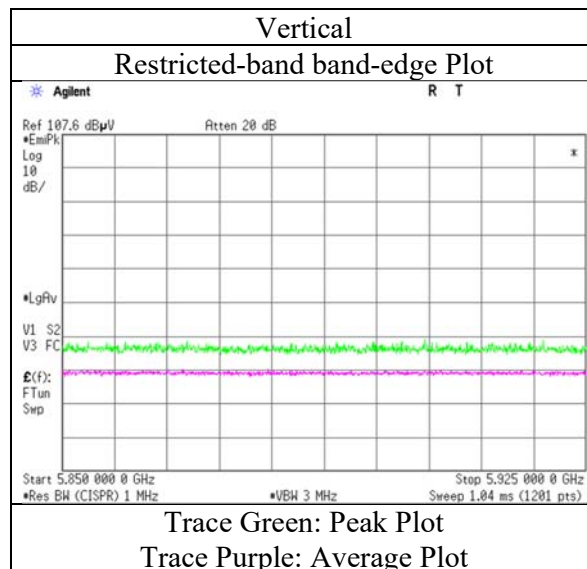
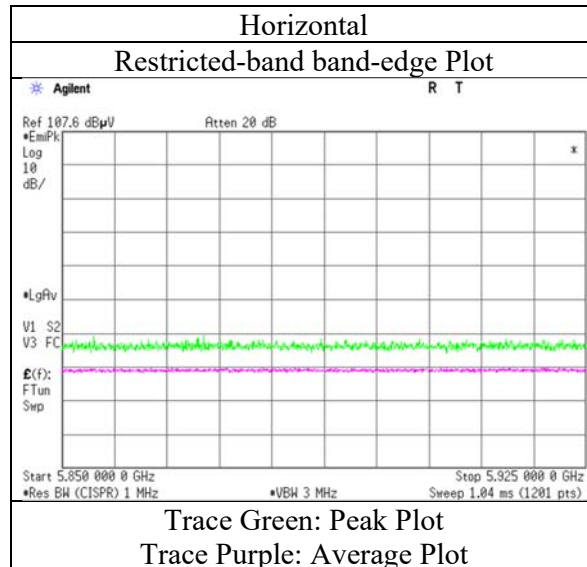
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No.	12749447H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 30, 2019
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Koji Yamamoto
Mode	Tx 11ac-40 5795 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

Radiated Spurious Emission

Report No. 12749447H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2 No.2
Date June 30, 2019 July 9, 2019
Temperature / Humidity 25 deg. C / 57 % RH 22 deg. C / 55 % RH
Engineer Koji Yamamoto Koji Yamamoto
(1 GHz - 10 GHz) (10 GHz - 40 GHz)
Mode Tx 11ac-80 5775 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.	1040.000	PK	49.8	25.5	3.3	35.4	-	43.2	73.9	30.7	
Hori.	1659.919	PK	44.9	25.2	3.7	34.7	-	39.1	73.9	34.8	
Hori.	3849.981	PK	46.5	30.1	4.9	33.5	-	47.9	73.9	26.0	
Hori.	5650.000	PK	42.3	32.1	5.6	33.3	-	46.6	68.2	21.6	
Hori.	5700.000	PK	46.3	32.2	5.6	33.3	-	50.8	105.2	54.4	
Hori.	5715.000	PK	47.7	32.2	5.6	33.3	-	52.2	109.4	57.2	
Hori.	5720.000	PK	47.3	32.2	5.6	33.3	-	51.8	110.8	59.1	
Hori.	5725.000	PK	46.3	32.2	5.6	33.3	-	50.8	122.2	71.4	
Hori.	5850.000	PK	47.6	32.5	5.6	33.3	-	52.4	122.2	69.8	
Hori.	5855.000	PK	43.0	32.5	5.6	33.3	-	47.9	110.8	62.9	
Hori.	5860.000	PK	42.4	32.5	5.6	33.3	-	47.2	109.4	62.2	
Hori.	5875.000	PK	43.2	32.5	5.6	33.3	-	48.0	105.2	57.2	
Hori.	5925.000	PK	41.5	32.5	5.7	33.3	-	46.3	68.2	21.9	
Hori.	11550.000	PK	41.4	40.1	-1.7	33.1	-	46.7	73.9	27.2	Floor noise
Hori.	17325.000	PK	44.1	40.9	-0.2	32.1	-	52.7	73.9	21.2	Floor noise
Hori.	23100.000	PK	45.2	38.7	-0.7	31.5	-	51.8	73.9	22.1	Floor noise
Hori.	1040.000	AV	43.4	25.5	3.3	35.4	-	36.8	53.9	17.1	
Hori.	1659.919	AV	36.5	25.2	3.7	34.7	-	30.7	53.9	23.2	
Hori.	3849.981	AV	35.6	30.1	4.9	33.5	3.9	41.0	53.9	12.9	
Hori.	11550.000	AV	34.3	40.1	-1.7	33.1	-	39.6	53.9	14.3	Floor noise
Hori.	17325.000	AV	35.9	40.9	-0.2	32.1	-	44.5	53.9	9.4	Floor noise
Hori.	23100.000	AV	37.5	38.7	-0.7	31.5	-	44.1	53.9	9.8	Floor noise
Vert.	1040.000	PK	48.7	25.5	3.3	35.4	-	42.1	73.9	31.8	
Vert.	1659.919	PK	44.6	25.2	3.7	34.7	-	38.8	73.9	35.1	
Vert.	3849.981	PK	46.1	30.1	4.9	33.5	-	47.5	73.9	26.4	
Vert.	5650.000	PK	42.1	32.1	5.6	33.3	-	46.5	68.2	21.7	
Vert.	5700.000	PK	45.6	32.2	5.6	33.3	-	50.1	105.2	55.2	
Vert.	5715.000	PK	50.4	32.2	5.6	33.3	-	54.9	109.4	54.6	
Vert.	5720.000	PK	51.4	32.2	5.6	33.3	-	55.9	110.8	54.9	
Vert.	5725.000	PK	50.4	32.2	5.6	33.3	-	54.8	122.2	67.4	
Vert.	5850.000	PK	48.3	32.5	5.6	33.3	-	53.1	122.2	69.1	
Vert.	5855.000	PK	44.4	32.5	5.6	33.3	-	49.2	110.8	61.6	
Vert.	5860.000	PK	43.2	32.5	5.6	33.3	-	48.1	109.4	61.3	
Vert.	5875.000	PK	42.0	32.5	5.6	33.3	-	46.8	105.2	58.4	
Vert.	5925.000	PK	42.1	32.5	5.7	33.3	-	47.0	68.2	21.3	
Vert.	11550.000	PK	41.5	40.1	-1.7	33.1	-	46.8	73.9	27.1	Floor noise
Vert.	17325.000	PK	44.2	40.9	-0.2	32.1	-	52.8	73.9	21.1	Floor noise
Vert.	23100.000	PK	45.4	38.7	-0.7	31.5	-	51.9	73.9	22.0	Floor noise
Vert.	1040.000	AV	41.4	25.5	3.3	35.4	-	34.8	53.9	19.1	
Vert.	1659.919	AV	36.3	25.2	3.7	34.7	-	30.5	53.9	23.4	
Vert.	3849.981	AV	37.5	30.1	4.9	33.5	3.9	42.9	53.9	11.0	
Vert.	11550.000	AV	34.2	40.1	-1.7	33.1	-	39.6	53.9	14.3	Floor noise
Vert.	17325.000	AV	35.8	40.9	-0.2	32.1	-	44.4	53.9	9.5	Floor noise
Vert.	23100.000	AV	37.4	38.7	-0.7	31.5	-	43.9	53.9	10.0	Floor noise

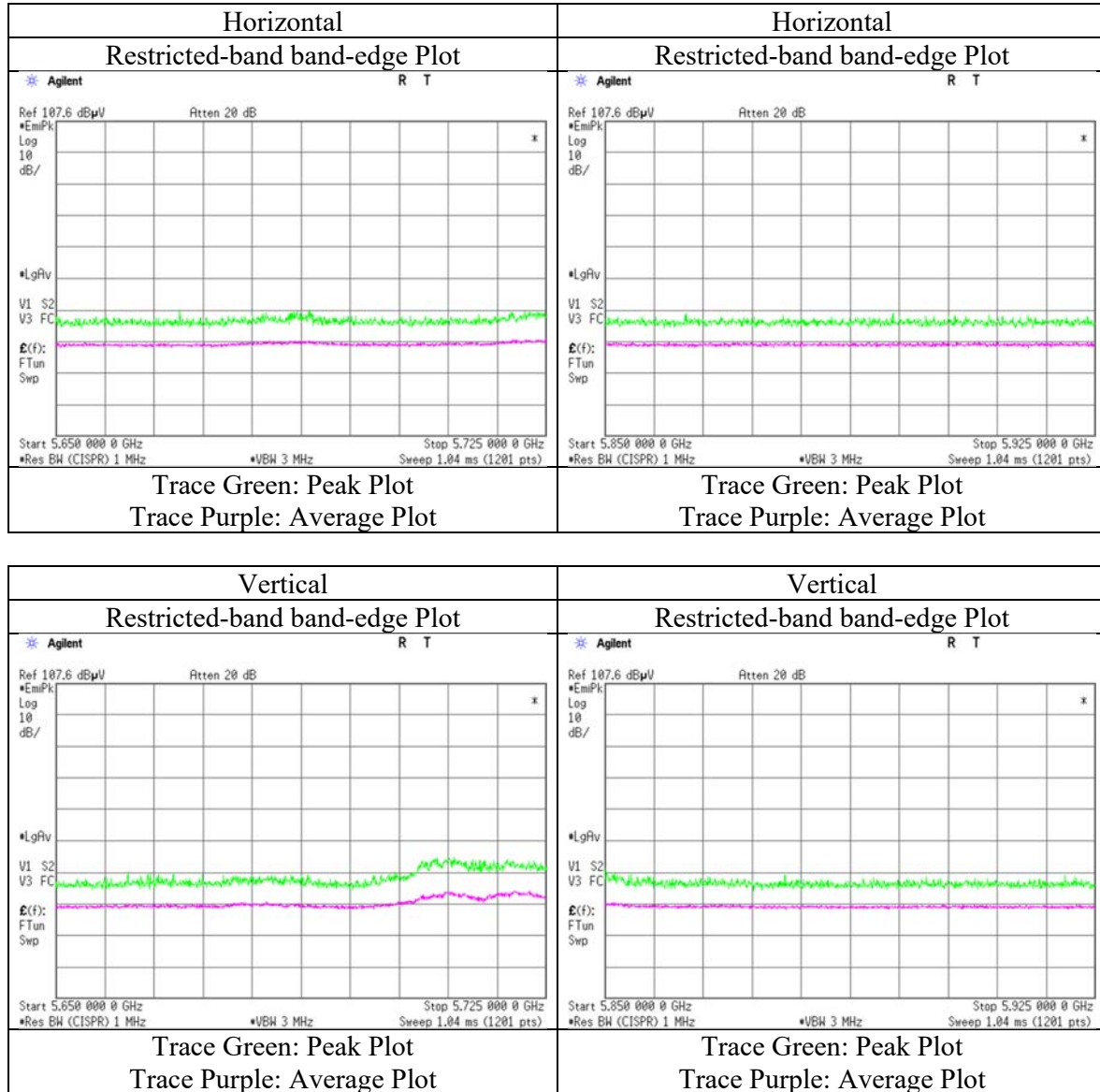
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*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 (3.6 m / 3.0 m) = 1.59 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

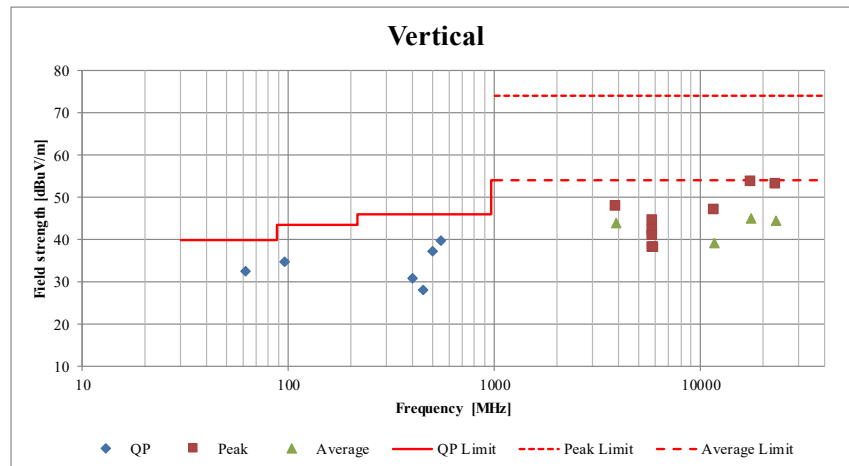
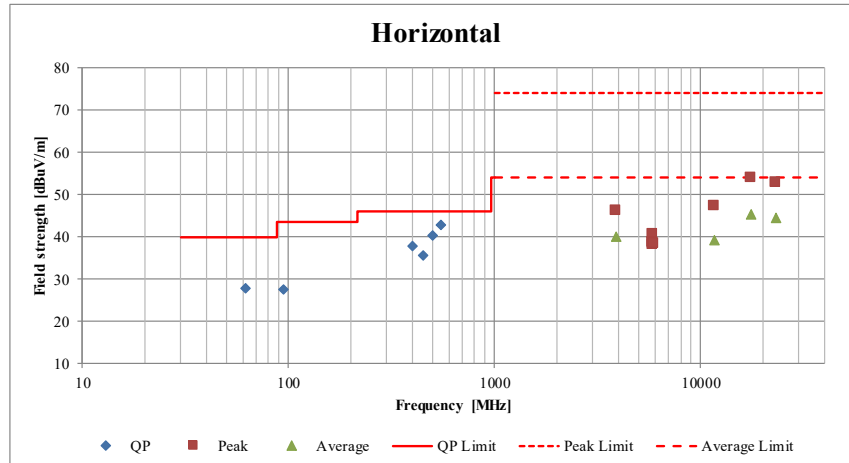
Report No.	12749447H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 30, 2019
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Koji Yamamoto
Mode	Tx 11ac-80 5775 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

Report No.	12749447H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	July 9, 2019	July 9, 2019	July 13, 2019
Temperature / Humidity	22 deg. C / 60 % RH	22 deg. C / 55 % RH	23 deg. C / 70 % RH
Engineer	Junya Okuno	Koji Yamamoto	Junya Okuno
	(1 GHz - 10 GHz)	(10 GHz - 40 GHz)	(Below 1 GHz)
Mode	Tx 11a 5825 MHz		



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

APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	142228	Measure	KOMELON	KMC-36	-	-	-	-
RE	141899	Spectrum Analyzer	AGILENT	E4448A	MY46180655	08/10/2018	08/31/2019	12
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/05/2018	12/31/2019	12
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	01/21/2019	01/31/2020	12
RE	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) 1608S087(5 m)	08/08/2018	08/31/2019	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	05/09/2019	05/31/2020	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/21/2018	08/31/2019	12
RE	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/01/2019	04/30/2021	24
RE	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	11/08/2018	11/30/2019	12
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	06/29/2018	06/30/2020	24
RE	141279	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S303	03/05/2019	03/31/2020	12
RE	141406	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCA	7001	09/19/2018	09/30/2019	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	05/10/2019	05/31/2020	12
RE	141517	Horn Antenna 26.5-40GHz	ETS LINDGREN	3160-10	152399	05/16/2019	05/31/2020	12
RE	141588	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33-8P / AMF-4F-2600	1871355 /1871328	09/21/2018	09/30/2019	12

*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:

RE: Radiated Emission

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