RADIO TEST REPORT

Test Report No. : 12902060H-A

Applicant	:	**DENSO TEN Limited**
Type of Equipment	:	**Car Audio**
Model No.	:	**FT0106B**
FCC ID	:	**BABFT0106B**
Test regulation	:	**FCC Part 15 Subpart C: 2019** **For Permissive Change** ***WLAN part** **(Radiated Spurious Emission test only)**
Test Result	:	**Complied (Refer to SECTION 3.2)**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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.

Date of test: June 10 to 13, 2019

Representative test engineer:
Junki Nagatomi
Engineer
Consumer Technology Division

Approved by:
Tsubasa Takayama
Leader
Consumer Technology Division

NVLAP TESTING NVLAP LAB CODE 200572-0

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

UL Japan, Inc.
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Telephone : +81 596 24 8999
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REVISION HISTORY

Original Test Report No.: 12902060H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12902060H-A	July 25, 2019	-	-

UL Japan, Inc.
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SECTION 1: Customer information

Company Name	:	DENSO TEN Limited
Address	:	2-28, Gosho-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 JAPAN
Telephone Number	:	+81-78-682-2159
Facsimile Number	:	+81-78-671-7160
Contact Person	:	DAISUKE FUKII

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	:	Car Audio
Model No.	:	FT0106B
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 12 V
Receipt Date of Sample (Information from test lab.)	:	June 3, 2019
Country of Mass-production	:	Mexico
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: FT0106B (referred to as the EUT in this report) is a Car Audio.

General Specification

Clock frequency(ies)	:	48 MHz (Crystal)
Operating Temperature	:	-20 deg. C- +65 deg. C

Radio Specification

WLAN (IEEE802.11b/g/n-20)

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS/OFDM
Antenna type	:	Inverted F Antenna
Antenna Gain	:	0.98 dBi

Bluetooth (Ver.4.2 + EDR)

Equipment Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Type of Modulation	:	FHSS, GFSK, π/4 DQPSK, 8 DPSK
Antenna Type	:	Inverted F Antenna
Antenna Gain	:	0.98 dBi

GPS Receiver

Type of Receiver	:	GPS Receiver
Frequency of Operation	:	1575.42 MHz ±1.023 MHz
Modulation	:	DSSS
Antenna type	:	GPS Antenna
Antenna Gain	:	29 dBi

AM / FM

Type of Receiver	:	Receiver
Frequency of Operation	:	AM: 530 kHz to 1710 kHz FM: 87.75 MHz to 107.9 MHz
Channel spacing	:	AM: 10 kHz FM: 200 kHz
Antenna connector type	:	AM / FM: HFC II

*This test report applies to WLAN function.
*Wireless LAN and Bluetooth do not transmit simultaneously.

<Contents of the change from original model>
Antenna of the EUT was modified and antenna gain is larger than original model.
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.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
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 C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

* The revisions made after testing date do not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	2.8 dB 9848.000 MHz, AV, Vert.	Complied# a)	Radiated (above 30 MHz) *1)
	IC: RSS-Gen 6.13	**IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6. 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)
This EUT provides stable voltage constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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 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.

Ise EMC Lab.

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

UL Japan, Inc. Ise EMC Lab.
*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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.

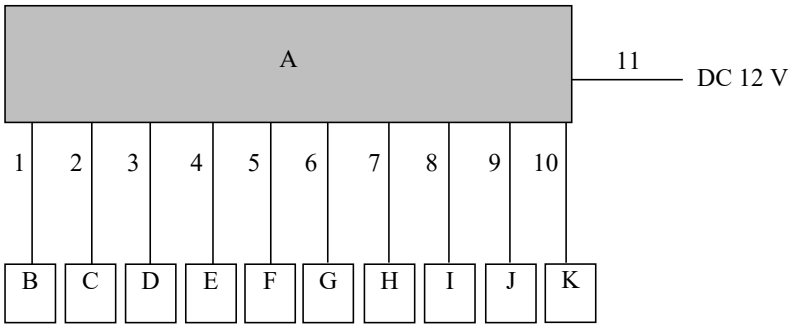
Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps (Short), PN9
IEEE 802.11g (11g)	18 Mbps, PN9
IEEE 802.11n (11n-20)	MCS 4 (Long GI), PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*EUT has the power settings by the software as follows (setting value might be different from product specification value); - Power Setting: 11b: 14 dBm, 11g: 11 dBm, 11n-20: 11 dBm - Software: QCA RCT Version 3.0.41.0 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Radiated Spurious Emission (Above 1GHz)	11b Tx 11n-20 Tx *1)	2412 MHz 2437 MHz 2462 MHz
Radiated Spurious Emission (Below 1GHz)	11n-20 Tx *2)	2462 MHz

*1) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.
*2) The mode was tested as a representative, because it had the highest power at antenna terminal test.

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	Car Audio	FT0106B	MR200045	DENSO TEN Limited	EUT
B	USB Memory	USM4GR B	17116 DGGNN	SONY	-
C	AM Dummy	828-00064-D1	No.6	-	-
D	FM Dummy	828-00064-D5	Z312515070049	-	-
E	XM Radio Antenna	1149	No.2	-	-
F	GPS Antenna	2354031090A15000	No.7	-	-
G	Speaker Dummy	-	-	-	-
H	Microphone	-	46	-	-
I	Smart Camera	867B0-76010	No.3	Panasonic	-
J	Back Camera	317616008-012	No.12	Panasonic	-
K	Steering switch	84250-53201	No.2	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	2.0	Shielded	Shielded	-
2	AM Antenna Cable	0.2	Shielded	Shielded	-
3	FM Antenna Cable	0.2	Shielded	Shielded	-
4	Signal Cable	7.2	Shielded	Shielded	-
5	Signal Cable	4.4	Shielded	Shielded	-
6	Signal Cable	3.5	Unshielded	Unshielded	-
7	Signal Cable	3.6	Unshielded	Unshielded	-
8	Signal Cable	3.75	Unshielded	Unshielded	-
9	Signal Cable	3.75	Unshielded	Unshielded	-
10	Signal Cable	3.5	Unshielded	Unshielded	-
11	DC Cable	4.5	Unshielded	Unshielded	

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[For below 1 GHz]
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 Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

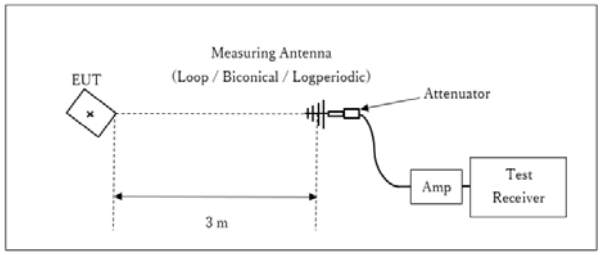
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	11.12.2.5.1 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces 11.12.2.5.2 The duty cycle was less than 98% for detected noise, a duty factor was added to the 11.12.2.5.1 results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on ANSI C63.10-2013.

Figure 2: Test Setup

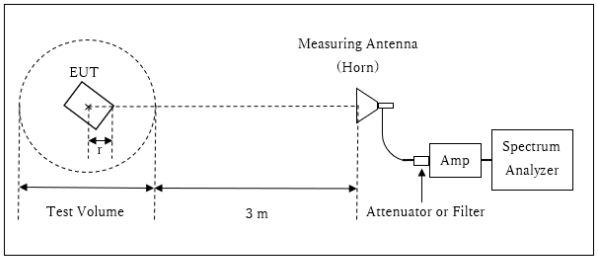
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

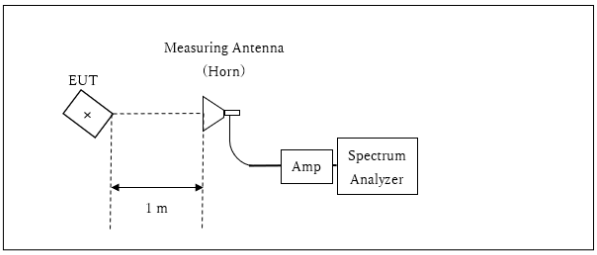


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.55 m / 3.0 m) = 1.47 dB
* Test Distance: (3 + Test Volume /2) - r = 3.55 m

Test Volume : 1.5 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.2 m

10 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

The test was made on EUT at the normal use position.

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

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

APPENDIX 1: Test data

Radiated Spurious Emission

Report No.	12902060H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 10, 2019	June 13, 2019
Temperature / Humidity	24 deg. C / 62 % RH	21 deg. C / 42 % RH
Engineer	Junya Okuno	Junki Nagatomi
	(1 GHz - 10 GHz)	(Above 10 GHz)
Mode	Tx 11b 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	50.3	27.3	4.7	34.3	-	48.0	73.9	25.9	
Hori.	4824.000	PK	43.7	31.6	6.8	33.5	-	48.6	73.9	25.3	Floor noise
Hori.	7236.000	PK	43.8	36.2	8.1	33.4	-	54.7	73.9	19.2	Floor noise
Hori.	2390.000	AV	42.1	27.3	4.7	34.3	0.3	40.1	53.9	13.8	*1)
Hori.	4824.000	AV	32.5	31.6	6.8	33.5	-	37.4	53.9	16.5	Floor noise
Hori.	7236.000	AV	33.0	36.2	8.1	33.4	-	43.9	53.9	10.0	Floor noise
Vert.	2390.000	PK	50.9	27.3	4.7	34.3	-	48.6	73.9	25.3	
Vert.	4824.000	PK	43.6	31.6	6.8	33.5	-	48.5	73.9	25.4	Floor noise
Vert.	7236.000	PK	43.8	36.2	8.1	33.4	-	54.7	73.9	19.2	Floor noise
Vert.	2390.000	AV	39.4	27.3	4.7	34.3	0.3	37.4	53.9	16.5	*1)
Vert.	4824.000	AV	32.6	31.6	6.8	33.5	-	37.6	53.9	16.3	Floor noise
Vert.	7236.000	AV	33.0	36.2	8.1	33.4	-	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 (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

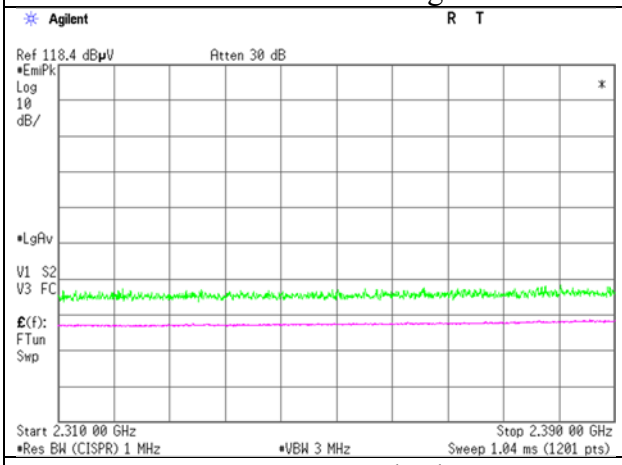
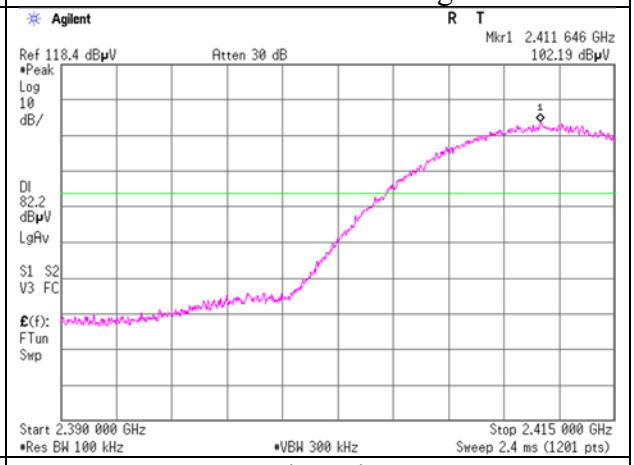
20dBc Data Sheet

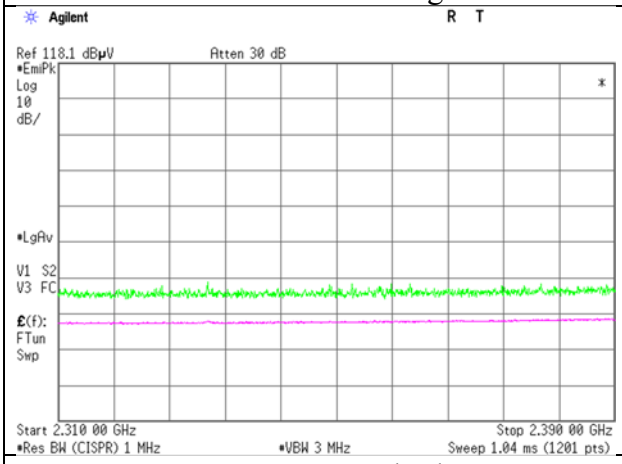
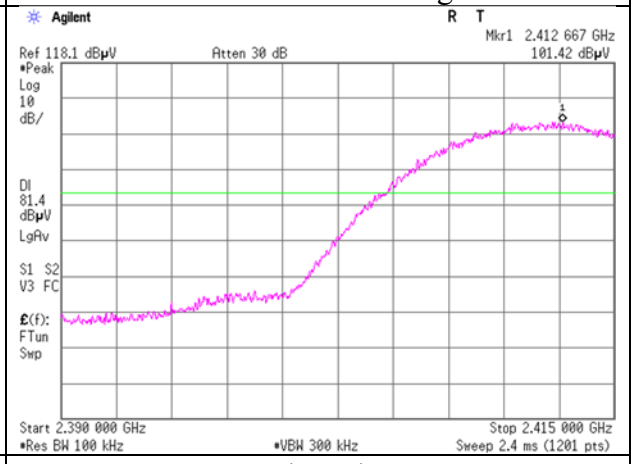
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	102.2	27.1	4.7	34.3	99.7	-	-	Carrier
Hori.	2400.000	PK	53.3	27.0	4.7	34.3	50.7	79.7	29.0	
Hori.	9648.000	PK	39.6	38.8	8.7	33.8	53.2	79.7	26.5	
Vert.	2412.000	PK	101.4	27.1	4.7	34.3	99.0	-	-	Carrier
Vert.	2400.000	PK	52.7	27.0	4.7	34.3	50.1	79.0	28.9	
Vert.	9648.000	PK	41.2	38.8	8.7	33.8	54.8	79.0	24.2	

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12902060H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 10, 2019
Temperature / Humidity	24 deg. C / 62 % RH
Engineer	Junya Okuno
	(1 GHz - 10 GHz)
Mode	Tx 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.	12902060H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 10, 2019	June 13, 2019
Temperature / Humidity	24 deg. C / 62 % RH	21 deg. C / 42 % RH
Engineer	Junya Okuno	Junki Nagatomi
	(1 GHz - 10 GHz)	(Above 10 GHz)
Mode	Tx 11b 2437 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	PK	41.7	31.7	6.8	33.5	-	46.7	73.9	27.2	Floor noise
Hori.	7311.000	PK	42.6	36.0	8.1	33.5	-	53.3	73.9	20.6	Floor noise
Hori.	9748.000	PK	45.0	38.8	7.2	33.4	-	57.6	73.9	16.3	
Hori.	4874.000	AV	32.8	31.7	6.8	33.5	-	37.8	53.9	16.1	Floor noise
Hori.	7311.000	AV	33.4	36.0	8.1	33.5	-	44.1	53.9	9.8	Floor noise
Hori.	9748.000	AV	36.0	38.8	7.2	33.4	0.3	48.9	53.9	5.0	
Vert.	4874.000	PK	41.7	31.7	6.8	33.5	-	46.7	73.9	27.2	Floor noise
Vert.	7311.000	PK	42.7	36.0	8.1	33.5	-	53.4	73.9	20.6	Floor noise
Vert.	9748.000	PK	45.3	38.8	7.2	33.4	-	57.9	73.9	16.1	
Vert.	4874.000	AV	32.4	31.7	6.8	33.5	-	37.5	53.9	16.4	Floor noise
Vert.	7311.000	AV	33.1	36.0	8.1	33.5	-	43.8	53.9	10.1	Floor noise
Vert.	9748.000	AV	36.5	38.8	7.2	33.4	0.3	49.4	53.9	4.5	

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 (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12902060H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 10, 2019	June 13, 2019
Temperature / Humidity	24 deg. C / 62 % RH	21 deg. C / 42 % RH
Engineer	Junya Okuno	Junki Nagatomi
	(1 GHz - 10 GHz)	(Above 10 GHz)
Mode	Tx 11b 2462 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	50.0	28.1	4.7	34.2	-	48.6	73.9	25.4	
Hori.	4924.000	PK	42.6	31.8	6.8	33.5	-	47.8	73.9	26.1	Floor noise
Hori.	7386.000	PK	42.8	36.2	8.1	33.5	-	53.7	73.9	20.2	Floor noise
Hori.	9848.000	PK	45.5	38.7	7.2	33.4	-	58.0	73.9	15.9	
Hori.	2483.500	AV	38.3	28.1	4.7	34.2	0.3	37.2	53.9	16.7	*1)
Hori.	4924.000	AV	32.2	31.8	6.8	33.5	-	37.3	53.9	16.6	Floor noise
Hori.	7386.000	AV	32.4	36.2	8.1	33.5	-	43.3	53.9	10.6	Floor noise
Hori.	9848.000	AV	36.5	38.7	7.2	33.4	0.3	49.3	53.9	4.6	
Vert.	2483.500	PK	49.0	28.1	4.7	34.2	-	47.6	73.9	26.3	
Vert.	4924.000	PK	42.5	31.8	6.8	33.5	-	47.7	73.9	26.2	Floor noise
Vert.	7386.000	PK	42.9	36.2	8.1	33.5	-	53.7	73.9	20.2	Floor noise
Vert.	9848.000	PK	45.4	38.7	7.2	33.4	-	57.9	73.9	16.0	
Vert.	2483.500	AV	39.2	28.1	4.7	34.2	0.3	38.1	53.9	15.8	*1)
Vert.	4924.000	AV	32.2	31.8	6.8	33.5	-	37.3	53.9	16.6	Floor noise
Vert.	7386.000	AV	32.4	36.2	8.1	33.5	-	43.2	53.9	10.7	Floor noise
Vert.	9848.000	AV	36.7	38.7	7.2	33.4	0.3	49.4	53.9	4.5	

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 (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

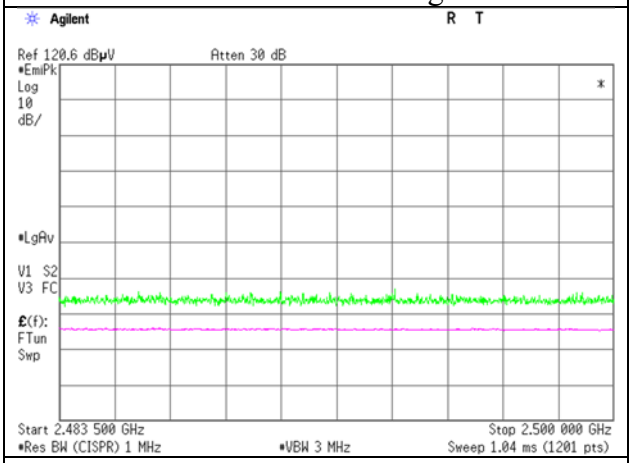
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12902060H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 10, 2019
Temperature / Humidity	24 deg. C / 62 % RH
Engineer	Junya Okuno
	(1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

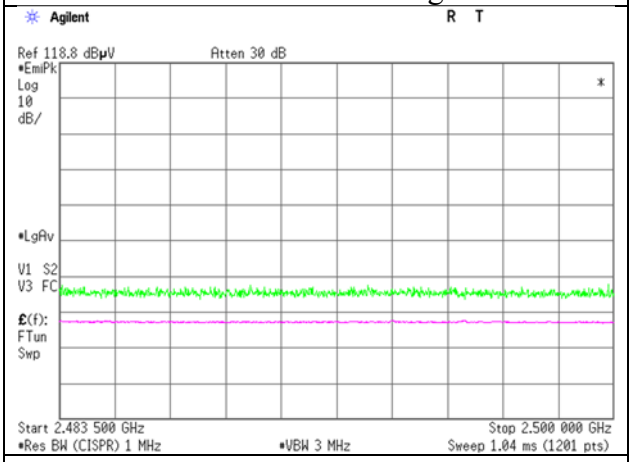
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.	12902060H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 10, 2019	June 13, 2019
Temperature / Humidity	24 deg. C / 62 % RH	21 deg. C / 42 % RH
Engineer	Junya Okuno	Junki Nagatomi
	(1 GHz - 10 GHz)	(Above 10 GHz)
Mode	Tx 11n-20 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	64.7	27.3	4.7	34.3	-	62.4	73.9	11.5	
Hori.	4824.000	PK	43.4	31.6	6.8	33.5	-	48.4	73.9	25.5	Floor noise
Hori.	7236.000	PK	43.7	36.2	8.1	33.4	-	54.6	73.9	19.3	Floor noise
Hori.	2390.000	AV	46.2	27.3	4.7	34.3	1.1	45.0	53.9	8.9	*1)
Hori.	4824.000	AV	32.5	31.6	6.8	33.5	-	37.4	53.9	16.5	Floor noise
Hori.	7236.000	AV	32.9	36.2	8.1	33.4	-	43.8	53.9	10.1	Floor noise
Vert.	2390.000	PK	62.5	27.3	4.7	34.3	-	60.2	73.9	13.7	
Vert.	4824.000	PK	43.6	31.6	6.8	33.5	-	48.6	73.9	25.3	Floor noise
Vert.	7236.000	PK	46.6	36.2	8.1	33.4	-	57.5	73.9	16.5	Floor noise
Vert.	2390.000	AV	45.0	27.3	4.7	34.3	1.1	43.7	53.9	10.2	*1)
Vert.	4824.000	AV	32.7	31.6	6.8	33.5	-	37.6	53.9	16.3	Floor noise
Vert.	7236.000	AV	33.0	36.2	8.1	33.4	-	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 (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

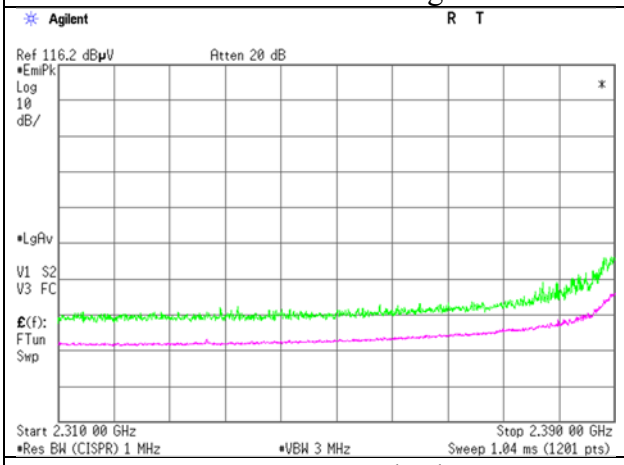
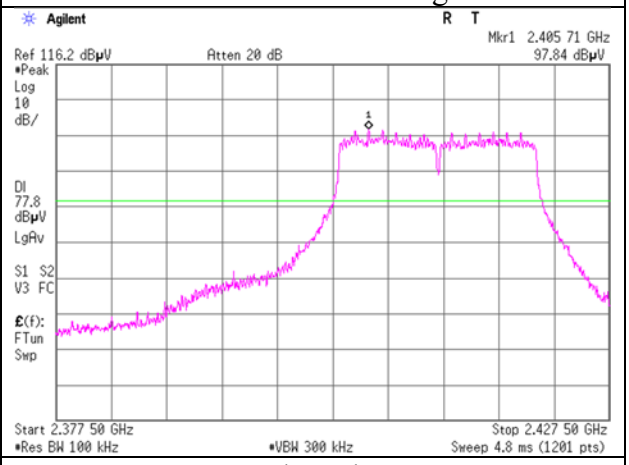
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	97.8	27.1	4.7	34.3	95.4	-	-	Carrier
Hori.	2400.000	PK	65.4	27.0	4.7	34.3	62.9	75.4	12.5	
Hori.	9648.000	PK	41.3	38.8	8.7	33.8	54.9	75.4	20.5	
Vert.	2412.000	PK	95.7	27.1	4.7	34.3	93.2	-	-	Carrier
Vert.	2400.000	PK	63.2	27.0	4.7	34.3	60.6	73.2	12.6	
Vert.	9648.000	PK	41.2	38.8	8.7	33.8	54.8	73.2	18.4	

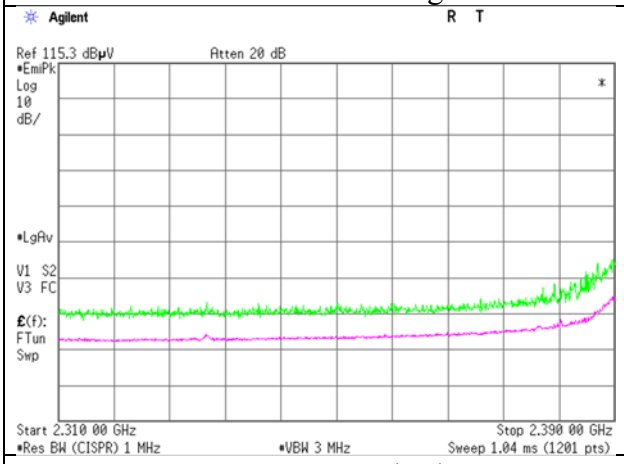
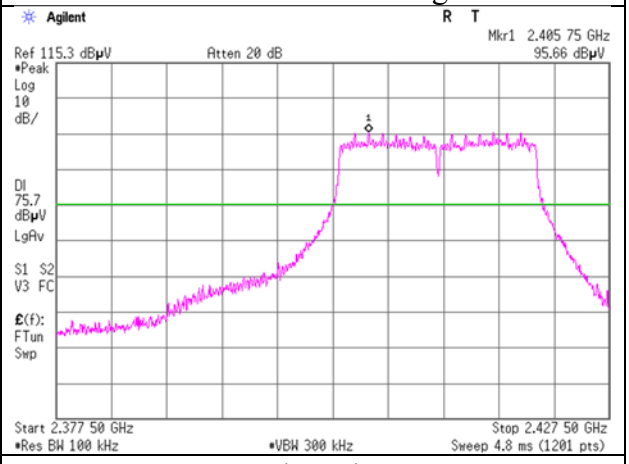
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor: 1 GHz - 10 GHz 20log (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12902060H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 10, 2019
Temperature / Humidity	24 deg. C / 62 % RH
Engineer	Junya Okuno
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.	12902060H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 10, 2019	June 13, 2019
Temperature / Humidity	24 deg. C / 62 % RH	21 deg. C / 42 % RH
Engineer	Junya Okuno	Junki Nagatomi
	(1 GHz - 10 GHz)	(Above 10 GHz)
Mode	Tx 11n-20 2437 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	PK	42.4	31.7	6.8	33.5	-	47.4	73.9	26.5	Floor noise
Hori.	7311.000	PK	44.2	36.0	8.1	33.5	-	54.8	73.9	19.1	Floor noise
Hori.	9748.000	PK	45.6	38.8	7.2	33.4	-	58.2	73.9	15.7	
Hori.	4874.000	AV	34.5	31.7	6.8	33.5	-	39.6	53.9	14.3	Floor noise
Hori.	7311.000	AV	34.9	36.0	8.1	33.5	-	45.5	53.9	8.4	Floor noise
Hori.	9748.000	AV	36.2	38.8	7.2	33.4	1.1	49.8	53.9	4.1	
Vert.	4874.000	PK	42.9	31.7	6.8	33.5	-	48.0	73.9	25.9	Floor noise
Vert.	7311.000	PK	43.8	36.0	8.1	33.5	-	54.5	73.9	19.4	Floor noise
Vert.	9748.000	PK	46.0	38.8	7.2	33.4	-	58.6	73.9	15.3	
Vert.	4874.000	AV	34.7	31.7	6.8	33.5	-	39.8	53.9	14.2	Floor noise
Vert.	7311.000	AV	34.9	36.0	8.1	33.5	-	45.6	53.9	8.3	Floor noise
Vert.	9748.000	AV	36.4	38.8	7.2	33.4	1.1	50.1	53.9	3.8	

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 (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12902060H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 10, 2019	June 12, 2019
Temperature / Humidity	24 deg. C / 58 % RH	21 deg. C / 42 % RH
Engineer	Junki Nagatomi (1 GHz -10 GHz)	Junki Nagatomi (Above 10 GHz) (Below 1GHz)
Mode	Tx 11n-20 2462 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	333.059	QP	40.9	14.6	9.1	29.4	-	35.3	46.0	10.7	
Hori.	487.498	QP	34.1	17.4	9.7	30.0	-	31.3	46.0	14.7	
Hori.	633.746	QP	30.8	19.5	10.3	29.5	-	31.0	46.0	15.0	
Hori.	877.489	QP	29.6	22.0	11.2	28.2	-	34.6	46.0	11.4	
Hori.	926.247	QP	29.9	22.1	11.4	27.9	-	35.5	46.0	10.5	
Hori.	991.233	QP	32.0	22.4	11.6	27.5	-	38.5	53.9	15.4	
Hori.	2483.500	PK	65.2	28.1	4.7	34.2	-	63.8	73.9	10.1	
Hori.	4924.000	PK	43.0	31.8	6.8	33.5	-	48.2	73.9	25.8	Floor noise
Hori.	7386.000	PK	43.4	36.2	8.1	33.5	-	54.3	73.9	19.7	Floor noise
Hori.	9848.000	PK	46.1	38.7	8.7	33.8	-	59.5	73.9	14.4	
Hori.	2483.500	AV	49.7	28.1	4.7	34.2	1.1	49.4	53.9	4.5	*1)
Hori.	4924.000	AV	31.9	31.8	6.8	33.5	-	37.1	53.9	16.8	Floor noise
Hori.	7386.000	AV	32.6	36.2	8.1	33.5	-	43.4	53.9	10.5	Floor noise
Hori.	9848.000	AV	35.9	38.7	8.7	33.8	1.1	50.4	53.9	3.5	
Vert.	333.059	QP	34.5	14.6	9.1	29.4	-	28.9	46.0	17.1	
Vert.	487.498	QP	30.2	17.4	9.7	30.0	-	27.4	46.0	18.6	
Vert.	633.746	QP	36.1	19.5	10.3	29.5	-	36.3	46.0	9.7	
Vert.	877.489	QP	30.2	22.0	11.2	28.2	-	35.2	46.0	10.8	
Vert.	926.247	QP	28.5	22.1	11.4	27.9	-	34.1	46.0	11.9	
Vert.	991.233	QP	31.5	22.4	11.6	27.5	-	38.0	53.9	15.9	
Vert.	2483.500	PK	63.6	28.1	4.7	34.2	-	62.2	73.9	11.7	
Vert.	4924.000	PK	43.0	31.8	6.8	33.5	-	48.2	73.9	25.8	Floor noise
Vert.	7386.000	PK	43.4	36.2	8.1	33.5	-	54.3	73.9	19.7	Floor noise
Vert.	9848.000	PK	46.3	38.7	8.7	33.8	-	59.8	73.9	14.2	
Vert.	2483.500	AV	41.0	28.1	4.7	34.2	1.1	40.7	53.9	13.2	*1)
Vert.	4924.000	AV	31.9	31.8	6.8	33.5	-	37.1	53.9	16.8	Floor noise
Vert.	7386.000	AV	32.6	36.2	8.1	33.5	-	43.4	53.9	10.5	Floor noise
Vert.	9848.000	AV	36.6	38.7	8.7	33.8	1.1	51.1	53.9	2.8	

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 (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

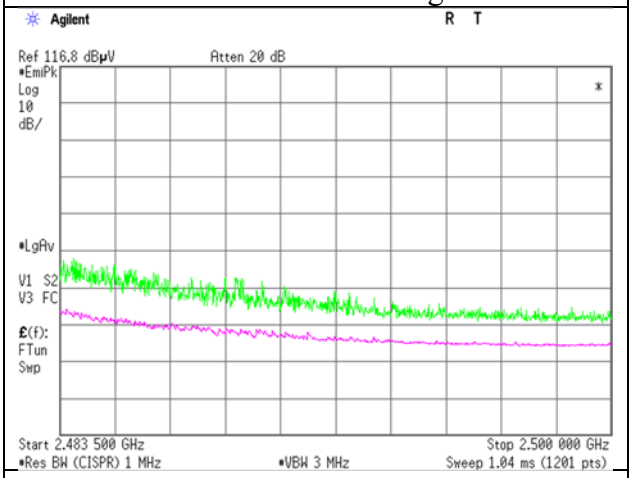
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12902060H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 10, 2019
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Junki Nagatomi (1 GHz -10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

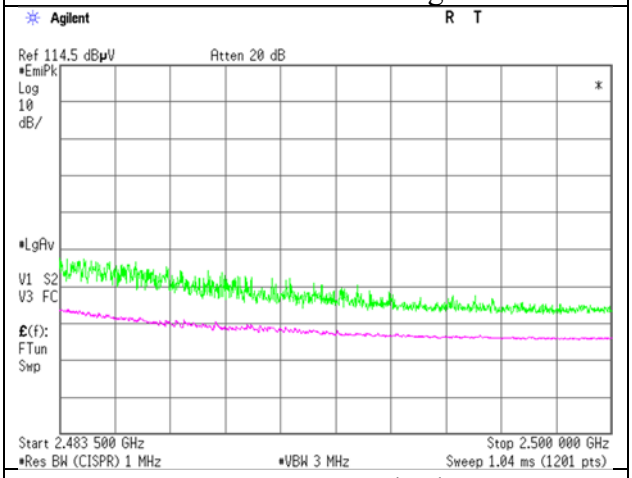
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

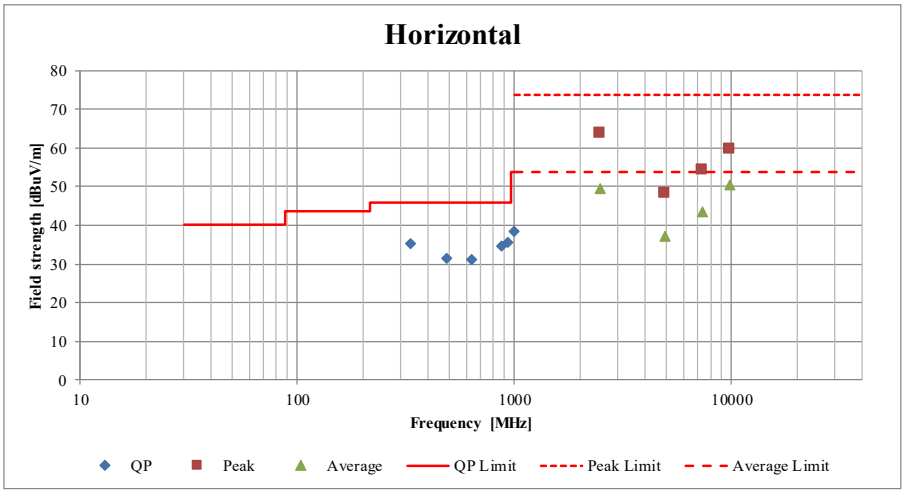


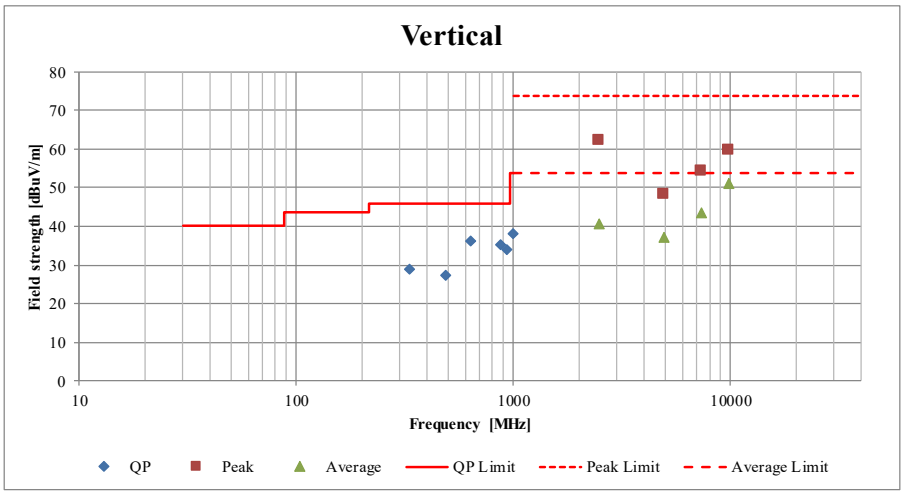
Trace Green : Peak Plot
Trace Purple : Average Plot

* 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
(Plot data, Worst case)

Report No.	12902060H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 10, 2019	June 12, 2019
Temperature / Humidity	24 deg. C / 58 % RH	21 deg. C / 42 % RH
Engineer	Junki Nagatomi	Junki Nagatomi
	(1 GHz -10 GHz)	(Above 10 GHz)
		(Below 1GHz)
Mode	Tx 11n-20 2462 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	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/01/2019	04/30/2020	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/21/2018	08/31/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	05/09/2019	05/31/2020	12
RE	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/19/2018	09/30/2019	12
RE	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	08/08/2018	08/31/2019	12
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	01/21/2019	01/31/2020	12
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/05/2018	12/31/2019	12
RE	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/07/2018	11/30/2019	12
RE	142228	Measure	KOMELON	KMC-36	-	-	-	-
RE	141427	Biconical Antenna	Schwarzbeck	VHA9103B	8031	04/12/2019	04/30/2020	12
RE	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	08/08/2018	08/31/2019	12
RE	141513	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	05/10/2019	05/31/2020	12
RE	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/19/2018	09/30/2019	12
RE	141317	Coaxial Cable	Fujikura/Agilent	-	-	02/25/2019	02/29/2020	12
RE	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/05/2018	11/30/2019	12
RE	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	03/25/2019	03/31/2020	12
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	06/29/2018	06/30/2020	24

***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 Spurious Emission test