



RADIO TEST REPORT

Test Report No. : 12046116H-A

Applicant : **DENSO TEN Limited**
Type of Equipment : **Car Audio**
Model No. : **FT0106B**
FCC ID : **BABFT0106B**
Test regulation : **FCC Part 15 Subpart C: 2017**
For Permissive Change
***WLAN part**
(Radiated Spurious Emission test only)
Test Result : **Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

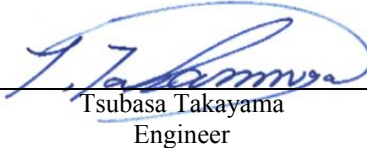
Date of test: November 7, 2017

Representative test engineer:


Yuta Moriya
Engineer

Consumer Technology Division

Approved by:


Tsubasa Takayama
Engineer

Consumer Technology Division



NVLAP LAB CODE: 200572-0

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

UL Japan, Inc.

Ise EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 12046116H-A

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SECTION 1: Customer information

Company Name	:	DENSO TEN Limited
Address	:	2-28, Goshō-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

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, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	November 1, 2017
Country of Mass-production	:	Mexico, 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: 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
Power Supply (inner)	: DC 1.8 V, DC 3.3 V
Antenna type	: Inverted F Antenna
Antenna Gain	: 0.96 dBi

Bluetooth (Ver.4.1 + EDR)

Equipment Type	: Transceiver
Frequency of Operation	: 2402 MHz - 2480 MHz
Type of Modulation	: FHSS, GFSK, $\pi/4$ DQPSK, 8 DPSK
Power Supply (inner)	: DC 1.8 V, DC 3.3 V
Antenna Type	: Inverted F Antenna
Antenna Gain	: 0.96 dBi

GPS Receiver

Type of Receiver	: GPS Receiver
Frequency of Operation	: 1575.42 MHz
Modulation	: DSSS
Power Supply (inner)	: DC 1.8 V
Antenna type	: GPS Antenna
Antenna Gain	: 29 dBi

*This test report applies to WLAN function.

*Wireless LAN and Bluetooth do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 2, 2017

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

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v04	FCC: Section15.247(d)	0.2 dB 2390.000 MHz, Horizontal, AV	Complied	Radiated (above 30 MHz *1)
	IC: RSS-Gen 6.13	IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					
*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v04 12.2.7.					

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

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 1.8 V, 3.3 V) 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

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

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

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

*Measurement distance

Radiated emission test

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

3.5 Test Location

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Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124
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	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	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.	

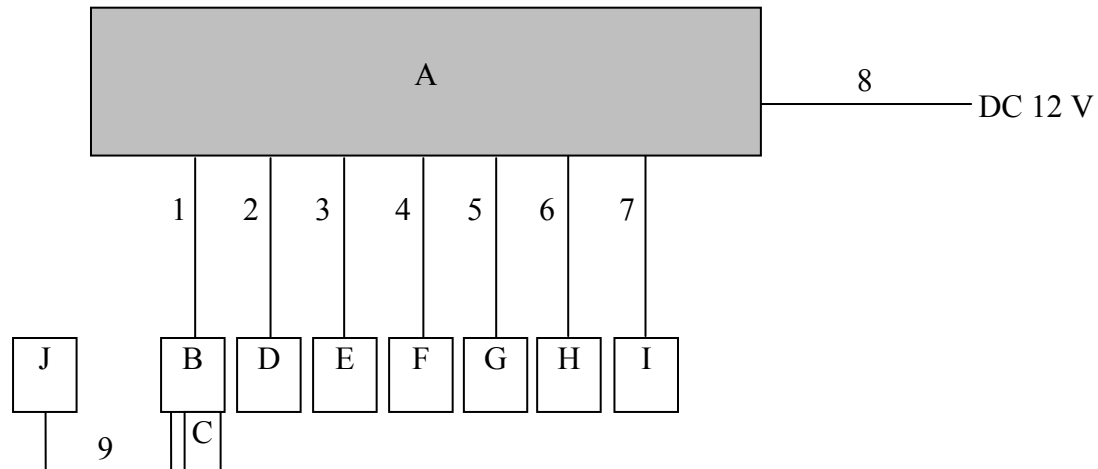
*The details of Operating mode(s)

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 Suppor equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio	FT0106B	AP700034	DENSO TEN Limited	EUT
B	USB/Audio Connector	-	-	-	-
C	USB Memory	RFU2-JV4GS	P11103	BUFFALO	-
D	Radio Antenna AMP	PP100021	86300-06250	-	-
E	GPS Antenna	-	27580071	-	-
F	Microphone	-	38	-	-
G	Camera	GP-KD7301RC	64F000034	-	-
H	Steering switch	75E717	-	-	-
I	AMP	-	-	-	-
J	iPod	A1367	CCQG50WDDCPC	Apple	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	2.0	Shielded	Shielded	-
2	Signal Cable	4.2	Unshielded	Unshielded	-
3	Signal Cable	7.0	Unshielded	Unshielded	-
4	Signal Cable	2.5	Unshielded	Unshielded	-
5	Signal Cable	2.8	Unshielded	Unshielded	-
6	Signal Cable	2.5	Unshielded	Unshielded	-
7	Signal Cable	3.0	Unshielded	Unshielded	-
8	DC Cable	1.3	Unshielded	Unshielded	-
9	Audio Cable	1.5	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.5 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)		4.5 m *2) (1 GHz -10 GHz), 1 m *3) (10 GHz - 26.5 GHz)

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

*2) Distance Factor: $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.53 \text{ dB}$

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

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

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APPENDIX 1: Test data

Radiated Spurious Emission

Report No. 12046116H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date November 7, 2017
Temperature / Humidity 22 deg. C / 44 % RH
Engineer Yuta Moriya
(Above 1 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	47.7	27.7	6.7	32.4	-	49.7	73.9	24.2	
Hori	4824.000	PK	41.0	31.7	9.0	31.4	-	50.3	73.9	23.6	Floor noise
Hori	7236.000	PK	43.2	36.1	10.4	32.1	-	57.6	73.9	16.3	Floor noise
Hori	2390.000	AV	38.5	27.7	6.7	32.4	0.3	40.8	53.9	13.1	*1)
Hori	4824.000	AV	32.4	31.7	9.0	31.4	-	41.7	53.9	12.2	Floor noise
Hori	7236.000	AV	31.2	36.1	10.4	32.1	-	45.6	53.9	8.3	Floor noise
Vert	2390.000	PK	46.8	27.7	6.7	32.4	-	48.8	73.9	25.1	
Vert	4824.000	PK	42.5	31.7	9.0	31.4	-	51.8	73.9	22.1	Floor noise
Vert	7236.000	PK	41.5	36.1	10.4	32.1	-	55.9	73.9	18.0	Floor noise
Vert	2390.000	AV	38.2	27.7	6.7	32.4	0.3	40.5	53.9	13.4	*1)
Vert	4824.000	AV	33.5	31.7	9.0	31.4	-	42.8	53.9	11.1	Floor noise
Vert	7236.000	AV	31.0	36.1	10.4	32.1	-	45.4	53.9	8.5	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

20dBc Data Sheet

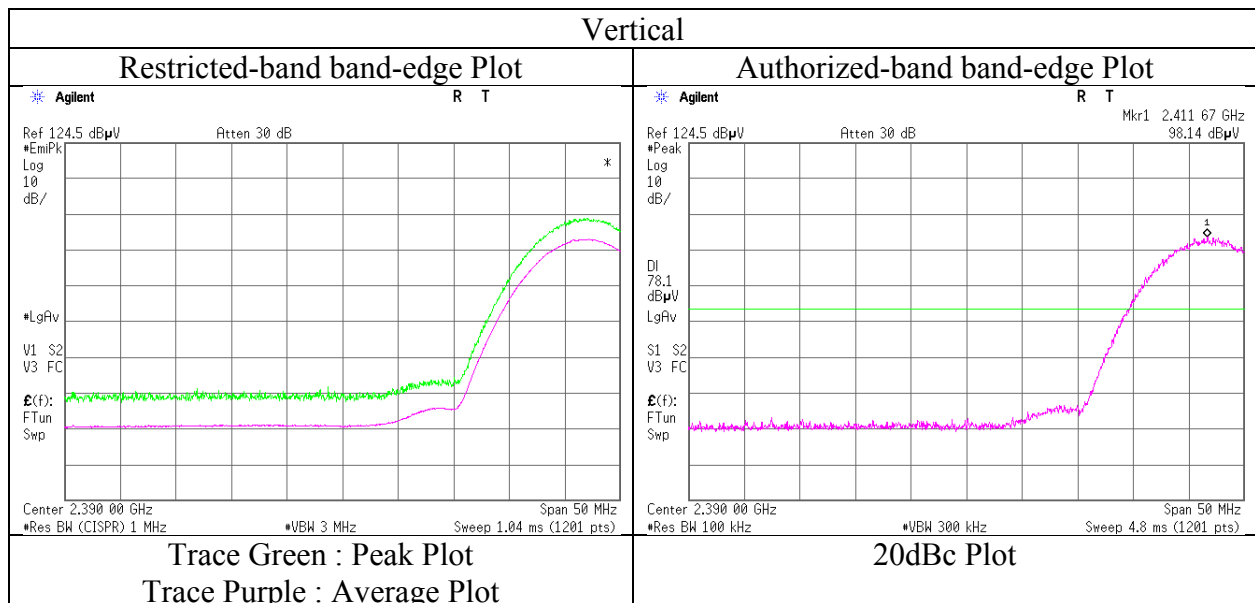
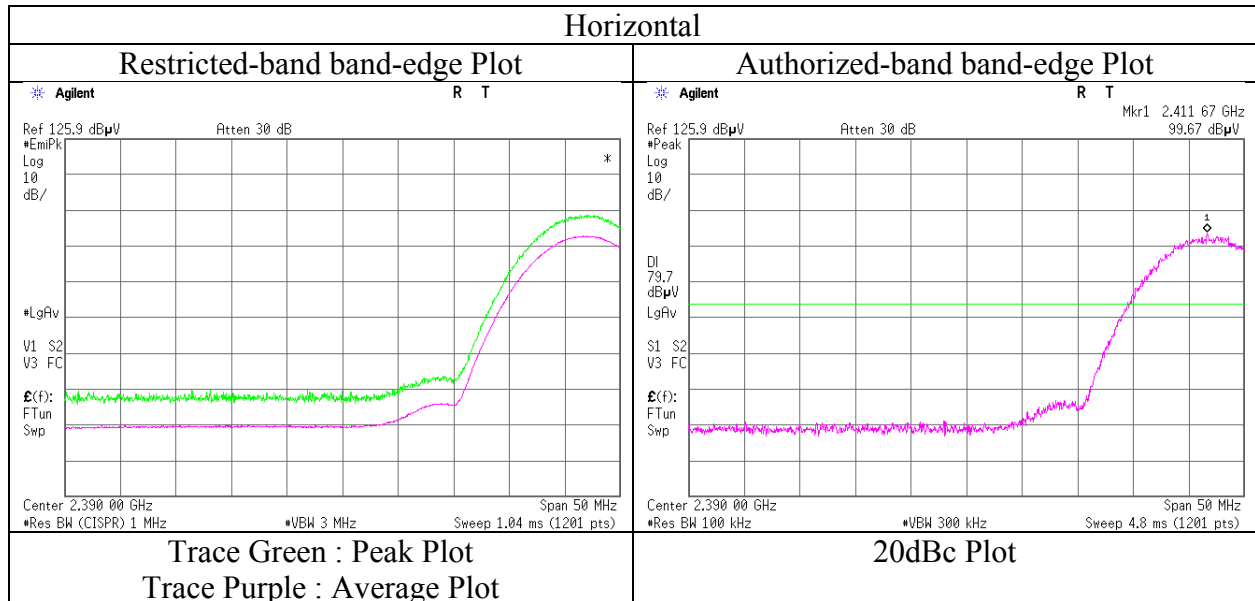
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	99.7	27.7	6.8	32.4	101.8	-	-	Carrier
Hori	2400.000	PK	50.0	27.7	6.8	32.4	52.1	81.8	29.7	
Hori	9648.000	PK	37.2	38.6	10.9	32.9	53.8	81.8	28.0	
Vert	2412.000	PK	98.1	27.7	6.8	32.4	100.2	-	-	Carrier
Vert	2400.000	PK	48.3	27.7	6.8	32.4	50.4	80.2	29.8	
Vert	9648.000	PK	37.7	38.6	10.9	32.9	54.3	80.2	25.9	

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12046116H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 7, 2017
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Yuta Moriya
	(Above 1 GHz)
Mode	Tx 11b 2412 MHz



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

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Radiated Spurious Emission

Report No. 12046116H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date November 7, 2017
Temperature / Humidity 22 deg. C / 44 % RH
Engineer Yuta Moriya
(Above 1 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	40.3	31.9	9.0	31.4	-	49.8	73.9	24.1	Floor noise
Hori	7311.000	PK	42.5	36.2	10.4	32.2	-	56.9	73.9	17.0	Floor noise
Hori	4874.000	AV	32.4	31.9	9.0	31.4	-	41.9	53.9	12.0	Floor noise
Hori	7311.000	AV	32.0	36.2	10.4	32.2	-	46.4	53.9	7.5	Floor noise
Vert	4874.000	PK	42.5	31.9	9.0	31.4	-	52.0	73.9	21.9	Floor noise
Vert	7311.000	PK	41.5	36.2	10.4	32.2	-	55.9	73.9	18.0	Floor noise
Vert	4874.000	AV	33.5	31.9	9.0	31.4	-	43.0	53.9	10.9	Floor noise
Vert	7311.000	AV	31.0	36.2	10.4	32.2	-	45.4	53.9	8.5	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2437.000	PK	98.0	27.7	6.8	32.4	100.1	-	-	Carrier
Hori	9748.000	PK	39.8	38.7	11.0	33.0	56.5	80.1	23.6	
Vert	2437.000	PK	96.6	27.7	6.8	32.4	98.7	-	-	Carrier
Vert	9748.000	PK	40.3	38.7	11.0	33.0	57.0	78.7	21.7	

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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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	44.4	27.8	6.8	32.4	-	46.6	73.9	27.3	
Hori	4924.000	PK	41.0	32.0	9.1	31.3	-	50.8	73.9	23.1	Floor noise
Hori	7386.000	PK	43.2	36.3	10.4	32.2	-	57.7	73.9	16.2	Floor noise
Hori	2483.500	AV	35.9	27.8	6.8	32.4	0.3	38.4	53.9	15.5	*1)
Hori	4924.000	AV	32.4	32.0	9.1	31.3	-	42.2	53.9	11.7	Floor noise
Hori	7386.000	AV	31.2	36.3	10.4	32.2	-	45.7	53.9	8.2	Floor noise
Vert	2483.500	PK	44.3	27.8	6.8	32.4	-	46.5	73.9	27.4	
Vert	4924.000	PK	42.5	32.0	9.1	31.3	-	52.3	73.9	21.6	Floor noise
Vert	7386.000	PK	42.0	36.3	10.4	32.2	-	56.5	73.9	17.4	Floor noise
Vert	2483.500	AV	33.7	27.8	6.8	32.4	0.3	36.2	53.9	17.7	*1)
Vert	4924.000	AV	33.6	32.0	9.1	31.3	-	43.4	53.9	10.5	Floor noise
Vert	7386.000	AV	31.2	36.3	10.4	32.2	-	45.7	53.9	8.2	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

20dBc Data Sheet

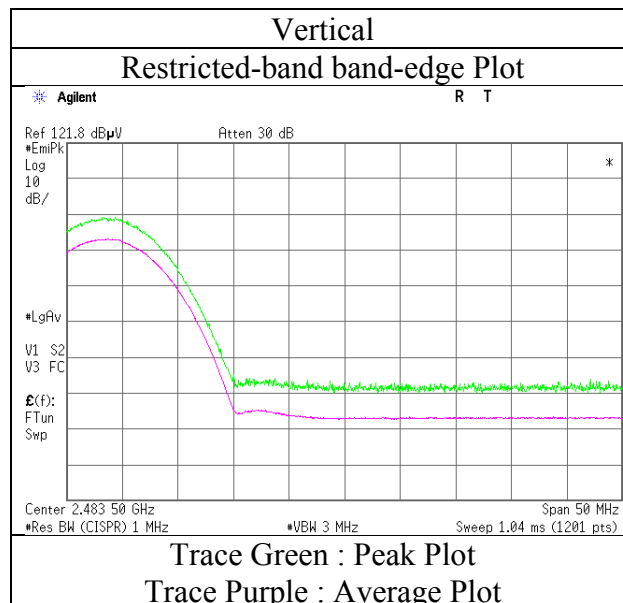
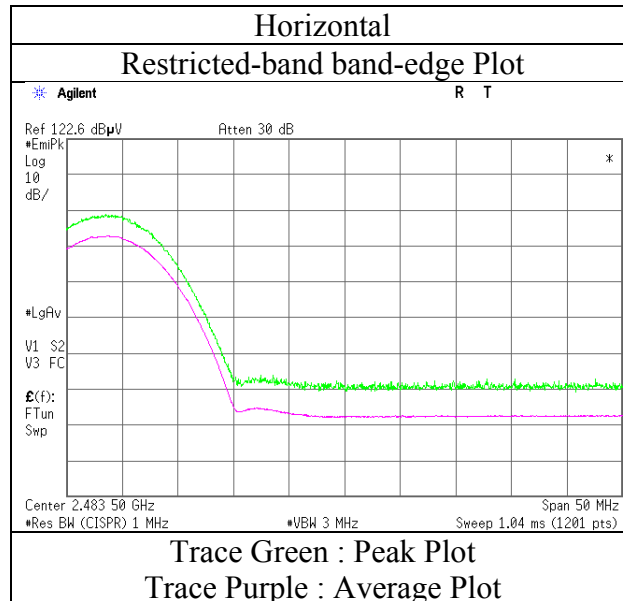
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2462.000	PK	96.2	27.8	6.8	32.4	98.4	-	-	Carrier
Hori	9848.000	PK	41.0	38.8	11.0	33.0	57.8	78.4	20.6	
Vert	2462.000	PK	95.9	27.8	6.8	32.4	98.1	-	-	Carrier
Vert	9848.000	PK	41.9	38.8	11.0	33.0	58.7	78.1	19.4	

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12046116H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 7, 2017
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Yuta Moriya
	(Above 1 GHz)
Mode	Tx 11b 2462 MHz



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

UL Japan, Inc.

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Radiated Spurious Emission

Report No. 12046116H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date November 7, 2017
Temperature / Humidity 22 deg. C / 44 % RH
Engineer Yuta Moriya
(Above 1 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	63.3	27.7	6.7	32.4	-	65.3	73.9	8.6	
Hori	4824.000	PK	40.8	31.7	9.0	31.4	-	50.1	73.9	23.8	Floor noise
Hori	7236.000	PK	42.0	36.1	10.4	32.1	-	56.4	73.9	17.5	Floor noise
Hori	2390.000	AV	50.6	27.7	6.7	32.4	1.1	53.7	53.9	0.2	*1)
Hori	4824.000	AV	32.4	31.7	9.0	31.4	-	41.7	53.9	12.2	Floor noise
Hori	7236.000	AV	31.1	36.1	10.4	32.1	-	45.5	53.9	8.4	Floor noise
Vert	2390.000	PK	61.0	27.7	6.7	32.4	-	63.0	73.9	10.9	
Vert	4824.000	PK	41.1	31.7	9.0	31.4	-	50.4	73.9	23.5	Floor noise
Vert	7236.000	PK	42.7	36.1	10.4	32.1	-	57.1	73.9	16.8	Floor noise
Vert	2390.000	AV	49.1	27.7	6.7	32.4	1.1	52.2	53.9	1.7	*1)
Vert	4824.000	AV	32.5	31.7	9.0	31.4	-	41.8	53.9	12.1	Floor noise
Vert	7236.000	AV	32.1	36.1	10.4	32.1	-	46.5	53.9	7.4	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

20dBc Data Sheet

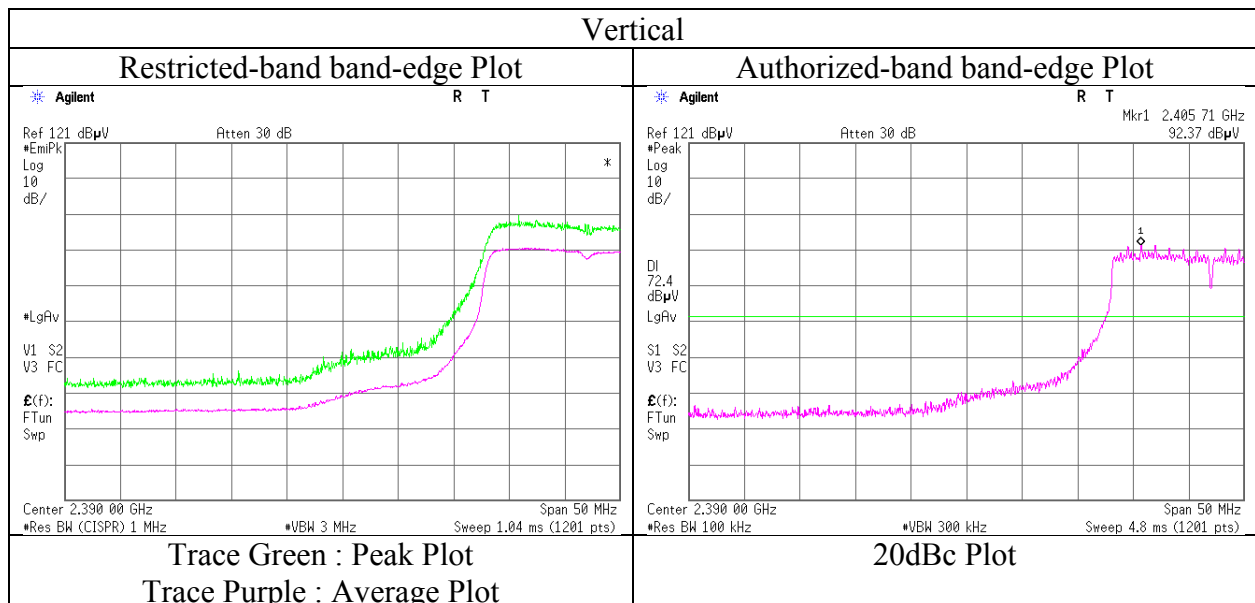
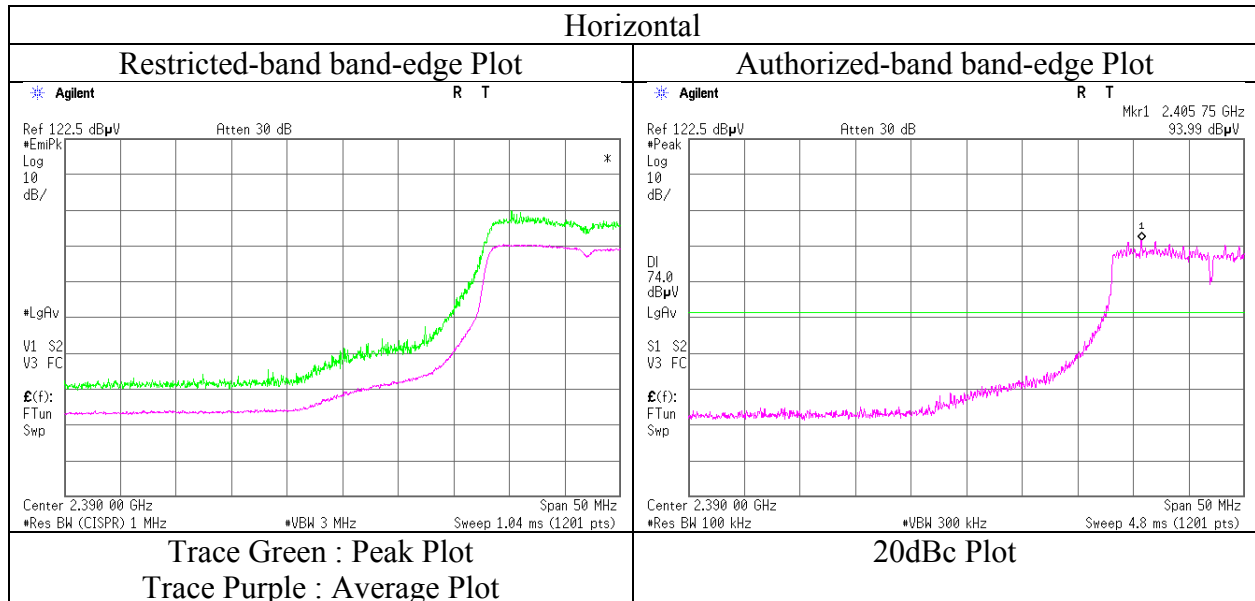
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	94.0	27.7	6.8	32.4	96.1	-	-	Carrier
Hori	2400.000	PK	61.9	27.7	6.8	32.4	64.0	76.1	12.1	
Hori	9648.000	PK	37.9	38.6	10.9	32.9	54.5	76.1	21.6	
Vert	2412.000	PK	92.3	27.7	6.8	32.4	94.4	-	-	Carrier
Vert	2400.000	PK	59.7	27.7	6.8	32.4	61.8	74.4	12.6	
Vert	9648.000	PK	37.8	38.6	10.9	32.9	54.4	74.4	20.0	

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12046116H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 7, 2017
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Yuta Moriya
	(Above 1 GHz)
Mode	Tx 11n-20 2412 MHz



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

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Radiated Spurious Emission

Report No. 12046116H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date November 7, 2017
Temperature / Humidity 22 deg. C / 44 % RH
Engineer Yuta Moriya
(Above 1 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	41.2	31.9	9.0	31.4	-	50.7	73.9	23.2	Floor noise
Hori	7311.000	PK	42.0	36.2	10.4	32.2	-	56.4	73.9	17.5	Floor noise
Hori	4874.000	AV	32.5	31.9	9.0	31.4	-	42.0	53.9	11.9	Floor noise
Hori	7311.000	AV	32.5	36.2	10.4	32.2	-	46.9	53.9	7.0	Floor noise
Vert	4874.000	PK	42.5	31.9	9.0	31.4	-	52.0	73.9	21.9	Floor noise
Vert	7311.000	PK	41.5	36.2	10.4	32.2	-	55.9	73.9	18.0	Floor noise
Vert	4874.000	AV	33.5	31.9	9.0	31.4	-	43.0	53.9	10.9	Floor noise
Vert	7311.000	AV	31.0	36.2	10.4	32.2	-	45.4	53.9	8.5	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 (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2437.000	PK	91.1	27.7	6.8	32.4	93.2	-	-	Carrier
Hori	9748.000	PK	39.1	38.7	11.0	33.0	55.8	73.2	17.4	
Vert	2437.000	PK	91.2	27.7	6.8	32.4	93.3	-	-	Carrier
Vert	9748.000	PK	39.7	38.7	11.0	33.0	56.4	73.3	16.9	

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

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5dB

Radiated Spurious Emission

Report No. 12046116H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date November 7, 2017
Temperature / Humidity 22 deg. C / 44 % RH
Engineer Yuta Moriya
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	147.464	QP	30.6	14.8	8.7	32.1	-	22.0	43.5	21.5	
Hori	294.909	QP	33.8	13.2	10.0	32.0	-	25.0	46.0	21.0	
Hori	331.770	QP	31.4	14.2	10.2	32.0	-	23.8	46.0	22.2	
Hori	487.497	QP	30.6	17.4	11.3	32.0	-	27.3	46.0	18.7	
Hori	926.246	QP	29.9	22.2	13.6	30.8	-	34.9	46.0	11.1	
Hori	2483.500	PK	58.7	27.8	6.8	32.4	-	60.9	73.9	13.0	
Hori	4924.000	PK	40.9	32.0	9.1	31.3	-	50.7	73.9	23.2	Floor noise
Hori	7386.000	PK	43.1	36.3	10.4	32.2	-	57.6	73.9	16.3	Floor noise
Hori	2483.500	AV	45.1	27.8	6.8	32.4	1.1	48.4	53.9	5.5	*1)
Hori	4924.000	AV	32.1	32.0	9.1	31.3	-	41.9	53.9	12.0	Floor noise
Hori	7386.000	AV	31.4	36.3	10.4	32.2	-	45.9	53.9	8.0	Floor noise
Vert	147.464	QP	32.7	14.8	8.7	32.1	-	24.1	43.5	19.4	
Vert	294.909	QP	33.9	13.2	10.0	32.0	-	25.1	46.0	20.9	
Vert	331.770	QP	30.0	14.2	10.2	32.0	-	22.4	46.0	23.6	
Vert	487.497	QP	29.6	17.4	11.3	32.0	-	26.3	46.0	19.7	
Vert	926.246	QP	30.7	22.2	13.6	30.8	-	35.7	46.0	10.3	
Vert	2483.500	PK	57.2	27.8	6.8	32.4	-	59.4	73.9	14.5	
Vert	4924.000	PK	41.8	32.0	9.1	31.3	-	51.6	73.9	22.3	Floor noise
Vert	7386.000	PK	42.5	36.3	10.4	32.2	-	57.0	73.9	16.9	Floor noise
Vert	2483.500	AV	36.7	27.8	6.8	32.4	1.1	40.0	53.9	13.9	*1)
Vert	4924.000	AV	32.1	32.0	9.1	31.3	-	41.9	53.9	12.0	Floor noise
Vert	7386.000	AV	32.0	36.3	10.4	32.2	-	46.5	53.9	7.4	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 (4.5 m / 3.0 m) = 3.53 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	2462.000	PK	91.5	27.8	6.8	32.4	93.7	-	-	Carrier
Hori	9848.000	PK	40.7	38.8	11.0	33.0	57.5	73.7	16.2	
Vert	2462.000	PK	88.4	27.8	6.8	32.4	90.6	-	-	Carrier
Vert	9848.000	PK	41.4	38.8	11.0	33.0	58.2	70.6	12.4	

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB

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

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Ise EMC Lab.

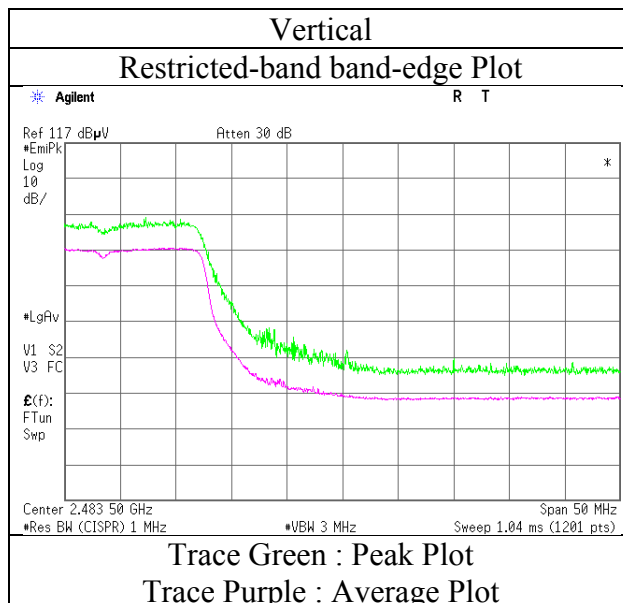
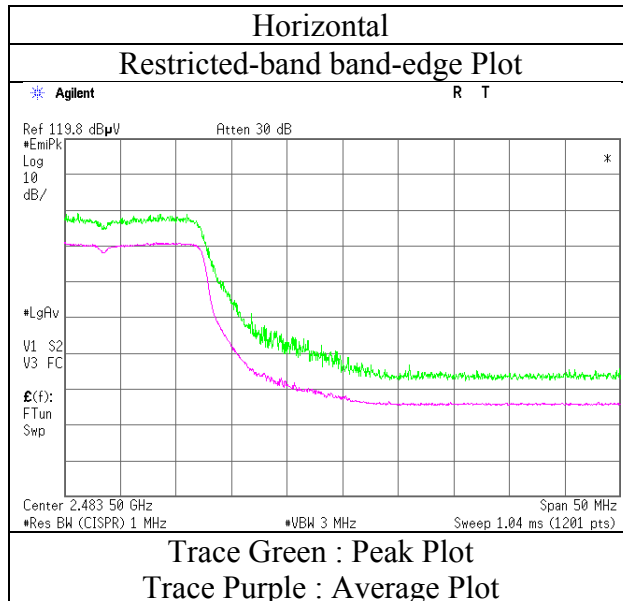
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12046116H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 7, 2017
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Yuta Moriya (Above 1 GHz)
Mode	Tx 11n-20 2462 MHz



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

UL Japan, Inc.

Ise EMC Lab.

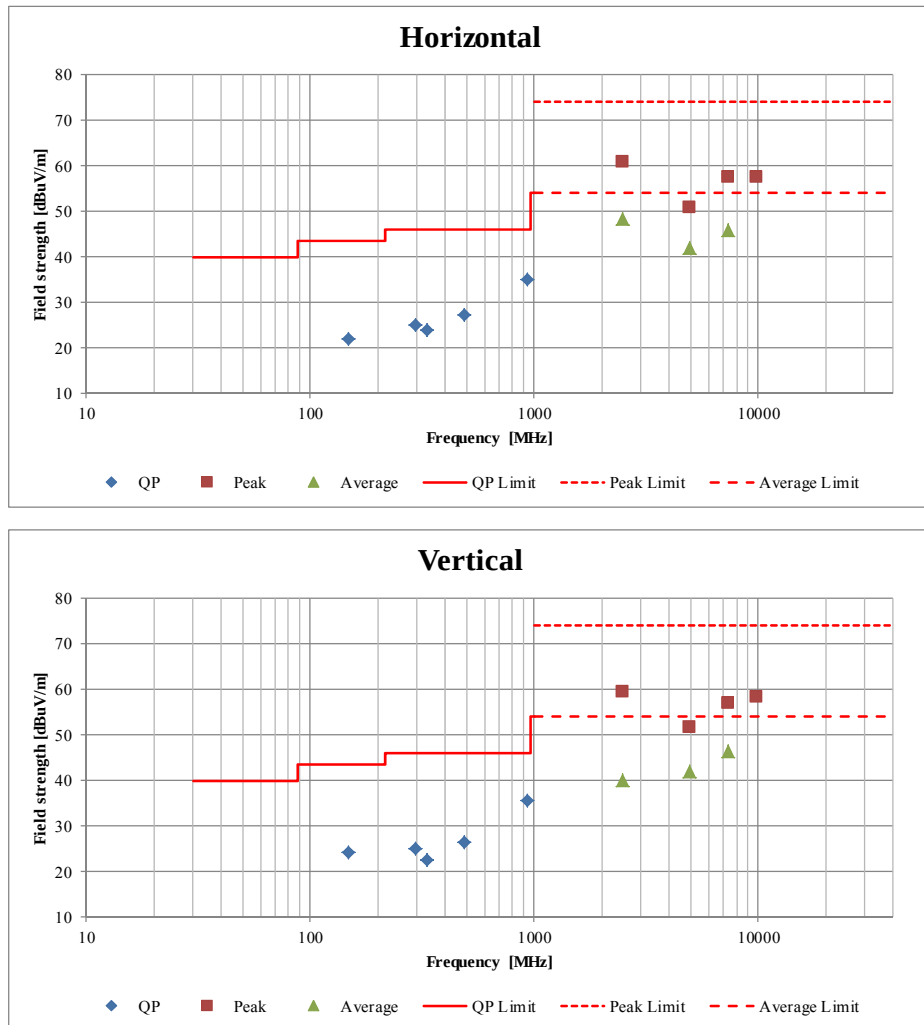
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Radiated Spurious Emission (Plot data, Worst case)

Report No. 12046116H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date November 7, 2017
Temperature / Humidity 22 deg. C / 44 % RH
Engineer Yuta Moriya
Mode Tx 11n-20 2462 MHz



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

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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2017/10/31 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2017/08/22 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2017/05/22 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2017/05/29 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2017/03/21 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2017/09/22 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2017/05/14 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2017/01/19 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2017/05/14 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2017/08/22 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2017/10/02 * 12
MLA-22	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2017/01/26 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2017/07/12 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2016/12/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12

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

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

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

Test Item: RE: Radiated Emission test

UL Japan, Inc.

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