RADIO TEST REPORT

Test Report No. : 12475916H-B-R1

Applicant	:	**RICOH COMPANY, LTD.**
Type of Equipment	:	**Digital Camera**
Model No.	:	**R02070**
FCC ID	:	**BBP-R02070**
Test regulation	:	**FCC Part 15 Subpart C: 2019** ***WLAN and Bluetooth Low Energy parts**
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 12475916H-B. 12475916H-B is replaced with this report.

Date of test: October 13, 2018 to March 16, 2019

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

REVISION HISTORY

Original Test Report No.: 12475916H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12475916H-B	March 29, 2019	-	-
1	12475916H-B-R1	July 9, 2019	P.1, 6	Update to FCC Part 15
1	12475916H-B-R1	July 9, 2019	P.1	Change of NVLAP logo to NVLAP combined ILAC MRK mark
1	12475916H-B-R1	July 9, 2019	P.6	Addition of explanatory note for FCC Part 15 Subpart B.
1	12475916H-B-R1	July 9, 2019	P.6	Correction of Worst margin frequency of Spurious Emission: from 2483.500 MHz to 2385.450 MHz
1	12475916H-B-R1	July 9, 2019	P.12	Addition of explanatory note for tilt
1	12475916H-B-R1	July 9, 2019	P.12	Deletion of unnecessary character
1	12475916H-B-R1	July 9, 2019	P.64	Correction of Reading value: 11g, 11n-20 and 11n-40

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SECTION 1: Customer information

Company Name	:	RICOH COMPANY, LTD.
Address	:	2-7-1 Izumi, Ebina, Kanagawa, 243-0460 Japan
Telephone Number	:	+81-46-249-8146
Facsimile Number	:	+81-3-6673-4430
Contact Person	:	Naohito Yazaki

The information provided from the customer is as follows;
- Applicant, Type of Equipment, Model No., FCC ID on the cover and other 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	:	Digital Camera
Model No.	:	R02070
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.6 V (Battery)
Receipt Date of Sample (Information from test lab.)	:	October 2, 2018
Country of Mass-production	:	Indonesia
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: R02070 (referred to as the EUT in this report) is a Digital Camera.

Operating Temperature: -10 deg. C to +40 deg. C

Radio Specification

WLAN (2.4 GHz band) *1)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Radio type	Transceiver			
Frequency of operation	2412 MHz - 2462 MHz			2422 MHz - 2452 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz			
Antenna type	Chip Antenna			
Antenna Gain	+0.6 dBi			

WLAN (5 GHz band)

Type of radio	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11ac (20 M band)	IEEE802.11n (40 M band)	IEEE802.11ac (40 M band)	IEEE802.11ac (80 M band)
Radio type	Transceiver					
Frequency of operation	5180 MHz - 5240 MHz			5190 MHz - 5230 MHz		5210 MHz
Type of modulation	OFDM (64QAM, 16QAM, QPSK)		OFDM (256QAM, 64QAM, 16QAM, QPSK)	OFDM (64QAM, 16QAM, QPSK)	OFDM (256QAM, 64QAM, 16QAM, QPSK)	
Channel spacing	20 MHz			40 MHz		80 MHz
Antenna type	Chip Antenna					
Antenna Gain	+1.8 dBi					

Bluetooth *1)

Type of radio	Bluetooth Ver.4.2
Radio type	Transceiver
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	FHSS (GFSK, π/4-DQPSK, 8-DPSK): BDR/EDR GFSK: BLE
Channel spacing	1 MHz: BDR/EDR 2 MHz: BLE
Antenna type	Chip Antenna
Antenna Gain	+0.6 dBi

NFC

Type of radio	NFC
Radio type	Transceiver
Frequency of operation	13.56 MHz
Type of modulation	ASK
Channel spacing	-
Antenna type	Pattern Antenna
Antenna Gain	-

*1) This test report applies to WLAN (2.4 GHz band) and Bluetooth Low Energy.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on June 4, 2019 and effective July 5, 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 revision on June 4, 2019, does not affect the test specification applied to the EUT.
** The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	**QP** 4.02 dB, 0.20046 MHz, N **AV** 12.32 dB, 0.20000 MHz, L	Complied a)	-
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section 15.247(a)(2)	See data.	Complied b)	Conducted
	IC: -	**IC:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section 15.247(b)(3)		Complied c)	Conducted
	IC: RSS-Gen 6.12	**IC:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section 15.247(e)		Complied d)	Conducted
	IC: -	**IC:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r01	**FCC:** Section15.247(d)	0.4 dB 2385.450 MHz, AV, Vert.	Complied# e), f)	Conducted (below 30 MHz)/ 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 v05r01 8.5 and 8.6.

a) Refer to APPENDIX 1 (data of Conducted Emission)
b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)
c) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
d) Refer to APPENDIX 1 (data of Power Density)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) 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 through the regulator 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

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	RSS-Gen 6.7	**IC:** -	N/A	- a)	Conducted
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 v05r01 8.5 and 8.6. a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)					
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.					

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

3.4 Uncertainty

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.
Ise EMC Lab.

Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.3 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.7 dB

Conducted emission

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

Radiated emission

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

3.5 Test Location

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

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	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.

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.

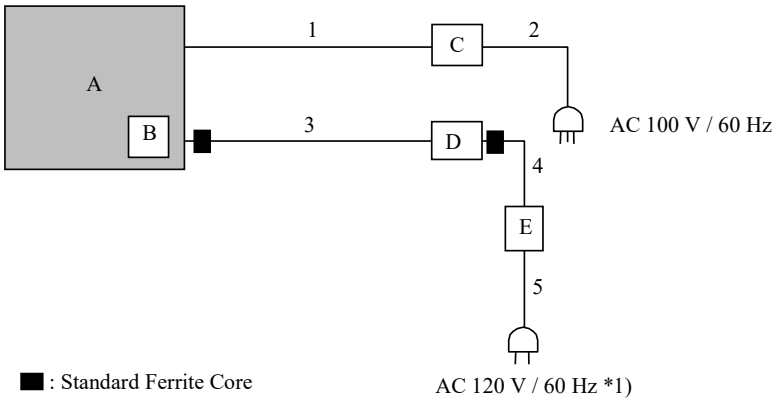
Mode	Remarks*
IEEE802.11b (11b)	11 Mbps, PN9
IEEE802.11g (11g)	48 Mbps, PN9
IEEE802.11n 20 MHz BW (11n-20)	MCS 3, PN9
IEEE 802.11n MIMO 40 MHz BW (11n-40)	MCS 2 (Long GI), PN9
Bluetooth Low Energy (BT LE)	Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b/g/n: 60 Bluetooth (LE) 7 dBm Software: Certification FW 001 *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
Conducted Emission	11n-40 Tx	2422 MHz
	BT LE Tx	2402 MHz 2440 MHz 2480 MHz
Spurious Emission (Conducted)	11n-40 Tx	2422 MHz
	BT LE Tx	2402 MHz 2440 MHz 2480 MHz
Spurious Emission (Radiated)	11b Tx	2412 MHz 2437 MHz 2462 MHz
	11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
	11n-40 Tx	2422 MHz 2437 MHz 2452 MHz
	BT LE Tx	2402 MHz 2440 MHz 2480 MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
	11n-40 Tx	2422 MHz 2437 MHz 2452 MHz
	BT LE	2402 MHz 2440 MHz 2480 MHz

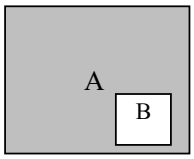
4.2 Configuration and peripherals

Conducted Emission and Radiated Emission test



*1) Conducted emission was performed on this port.

Antenna Terminal Conducted test



* 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	Remark
A	Digital Camera	R02070	1004 used for CE* and RE* 1009 used for AT*	RICOH COMPANY, LTD.	EUT
B	LI-ION Battery Pack	DB-110	20170328WAB	RICOH COMPANY, LTD.	-
C	Monitor	M237WS-PM	107KC8020445	LG	-
D	Laptop PC	CF-N8HWCDPS	9LKSA04258	Panasonic	-
E	AC Adapter	CF-AA6372B	6372BM409X14190B	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	HDMI Cable	1.0	Shielded	Shielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-
3	USB Cable	1.0	Shielded	Shielded	*1)
4	DC cable	1.0	Unshielded	Unshielded	-
5	AC cable	1.0	Unshielded	Unshielded	-

*1) This Cable was accessory of the EUT. This is only used to the EUT.

* CE: Conducted Emission
* RE: Radiated Emission
* AT: Antenna Terminal Conducted test

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

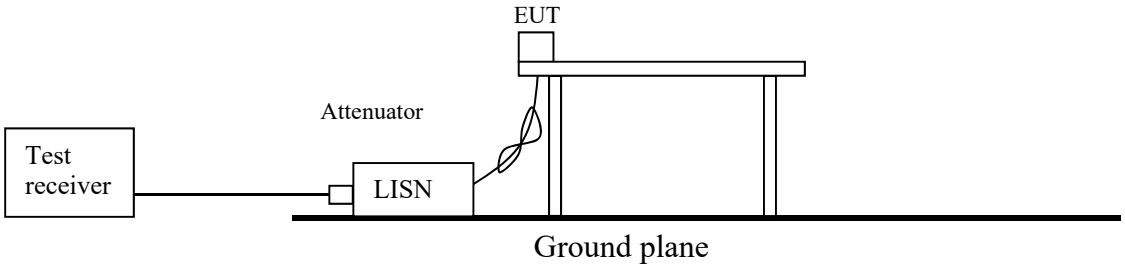
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected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

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber. The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

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

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r01".

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

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

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

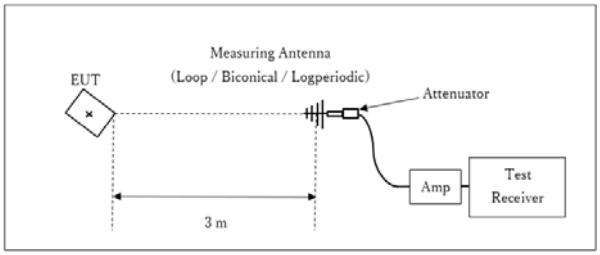
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

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	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

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

Figure 2: Test Setup

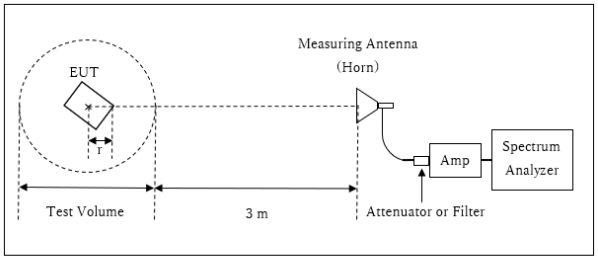
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



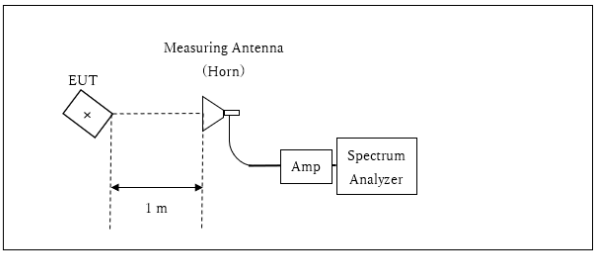
r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (4.0 m / 3.0 m) = 2.5 dB
* Test Distance: (3 + Test Volume /2) - r = 4.0 m

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

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

10 GHz - 26.5 GHz



× : Center of turn table

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

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

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

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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	11b: 20 MHz 11g/11n-20: 26 MHz 11n-40: 52 MHz BLE: 3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz).

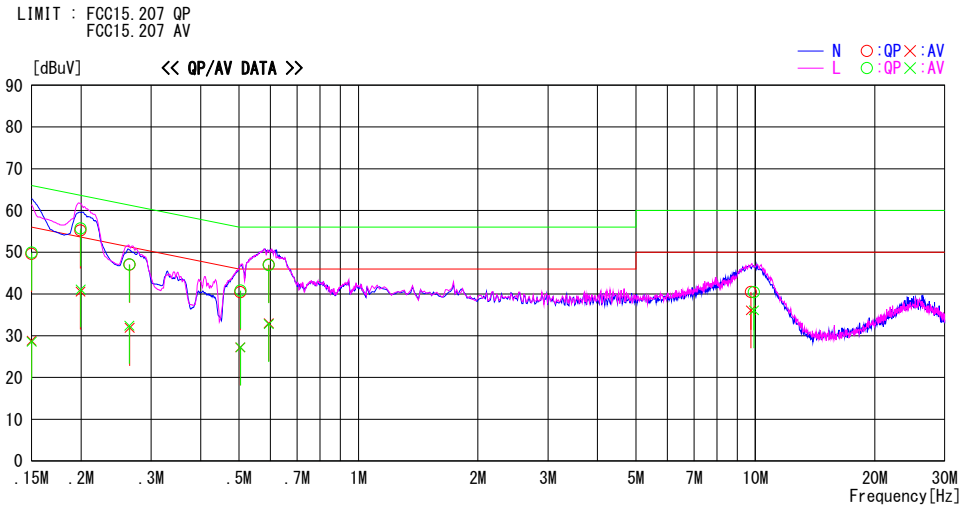
The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Date	November 18, 2018
Temperature / Humidity	21 deg. C / 41 % RH
Engineer	Yuta Moriya
Mode	Tx 11n-40 2422 MHz



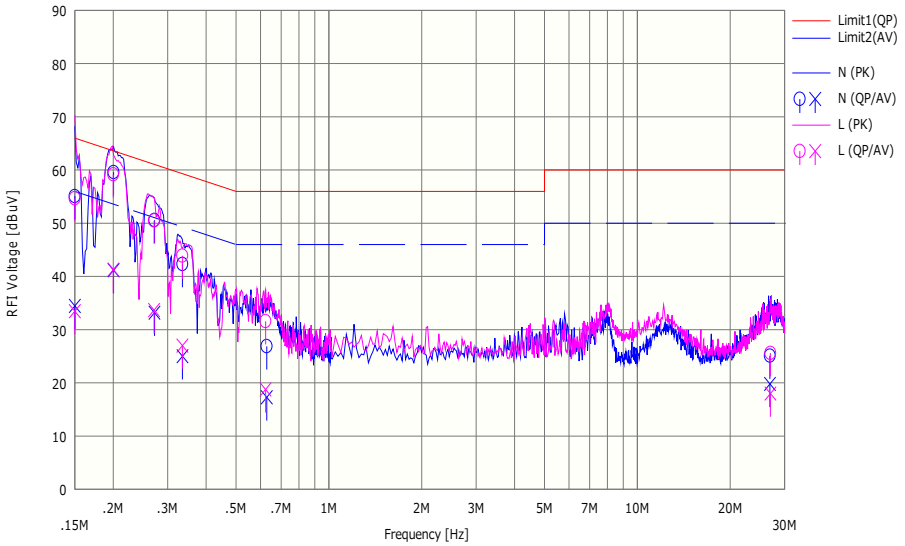
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV	Factor	QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15005	36.1	15.3	13.5	49.6	28.8	66.0	56.0	16.4	27.2	N
0.15013	36.4	15.1	13.5	49.9	28.6	66.0	56.0	16.1	27.4	L
0.19940	41.7	27.1	13.5	55.2	40.6	63.6	53.6	8.4	13.0	N
0.19948	42.2	27.6	13.5	55.7	41.1	63.6	53.6	7.9	12.5	L
0.26511	33.5	18.4	13.5	47.0	31.9	61.3	51.3	14.3	19.4	N
0.26475	33.6	18.9	13.5	47.1	32.4	61.3	51.3	14.2	18.9	L
0.50419	27.3	13.7	13.5	40.8	27.2	56.0	46.0	15.2	18.8	L
0.50387	26.9	13.7	13.5	40.4	27.2	56.0	46.0	15.6	18.8	N
0.59400	33.3	19.2	13.6	46.9	32.8	56.0	46.0	9.1	13.2	L
0.59397	33.4	19.4	13.6	47.0	33.0	56.0	46.0	9.0	13.0	N
9.91664	26.2	21.9	14.2	40.4	36.1	60.0	50.0	19.6	13.9	L
9.74834	26.3	21.9	14.2	40.5	36.1	60.0	50.0	19.5	13.9	N

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

Conducted Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Date	March 16, 2019
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx BT LE 2402 MHz

Limit : FCC_Part 15 Subpart C(15.207)



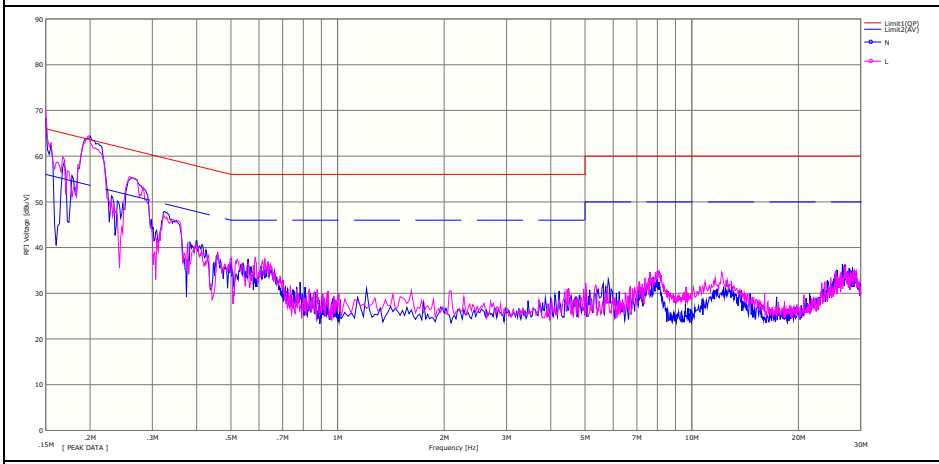
No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	LISN	LOSS	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	41.90	21.30	0.06	13.11	55.07	34.47	66.00	56.00	10.93	21.53	N	
2	0.20046	46.40	28.00	0.06	13.12	59.58	41.18	63.60	53.60	4.02	12.42	N	
3	0.27202	37.40	20.00	0.05	13.13	50.58	33.18	61.10	51.10	10.52	17.92	N	
4	0.33517	29.10	11.80	0.05	13.15	42.30	25.00	59.30	49.30	17.00	24.30	N	
5	0.62850	13.60	4.00	0.06	13.20	26.86	17.26	56.00	46.00	29.14	28.74	N	
6	26.91200	10.10	4.80	0.49	14.50	25.09	19.79	60.00	50.00	34.91	30.21	N	
7	0.15000	41.50	20.30	0.06	13.11	54.67	33.47	66.00	56.00	11.33	22.53	L	
8	0.20000	46.00	28.10	0.06	13.12	59.18	41.28	63.60	53.60	4.42	12.32	L	
9	0.27120	37.30	20.50	0.05	13.13	50.48	33.68	61.10	51.10	10.62	17.42	L	
10	0.33500	30.70	13.80	0.05	13.15	43.90	27.00	59.30	49.30	15.40	22.30	L	
11	0.62328	18.30	5.50	0.06	13.20	31.56	18.76	56.00	46.00	24.44	27.24	L	
12	27.00000	10.60	3.00	0.49	14.50	25.59	17.99	60.00	50.00	34.41	32.01	L	

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

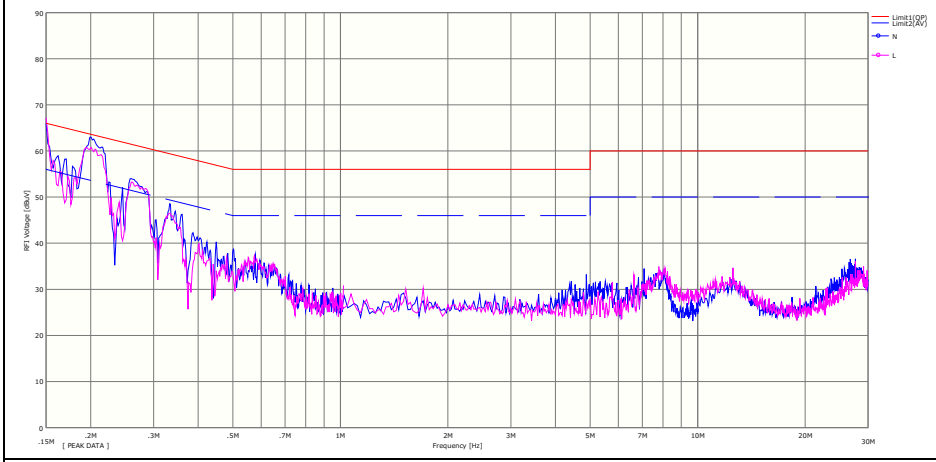
Conducted Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Date	March 16, 2019
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx BT LE

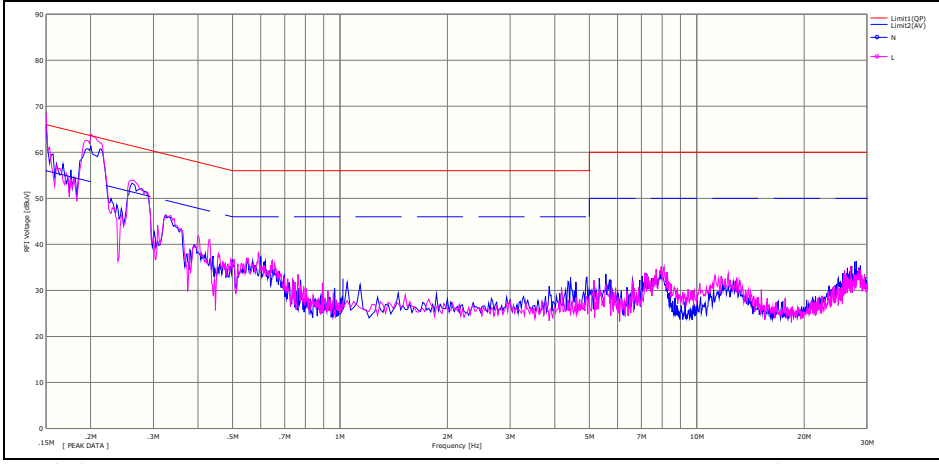
2402 MHz



2440 MHz



2480 MHz



Y scale [dBuV] Chart — N — L

6 dB Bandwidth and 99 % Occupied Bandwidth

Report No.	12475916H	
Test place	Ise EMC Lab. No.8 Measurement Room	
Date	October 23, 2018	October 25, 2018
Temperature / Humidity	24 deg. C / 51 % RH	26 deg. C / 34 % RH
Engineer	Takumi Shimada	Takafumi Noguchi
Mode	Tx	

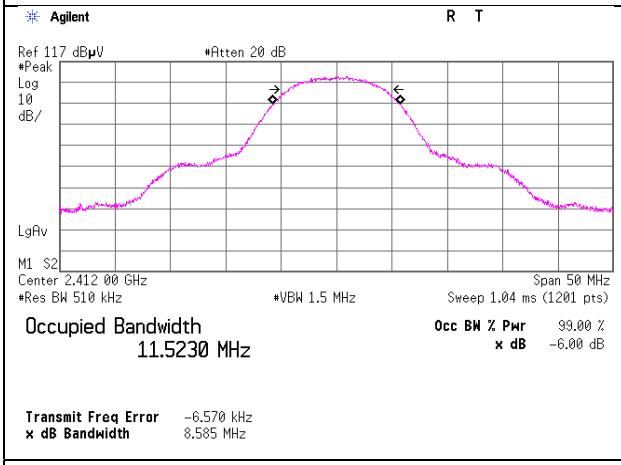
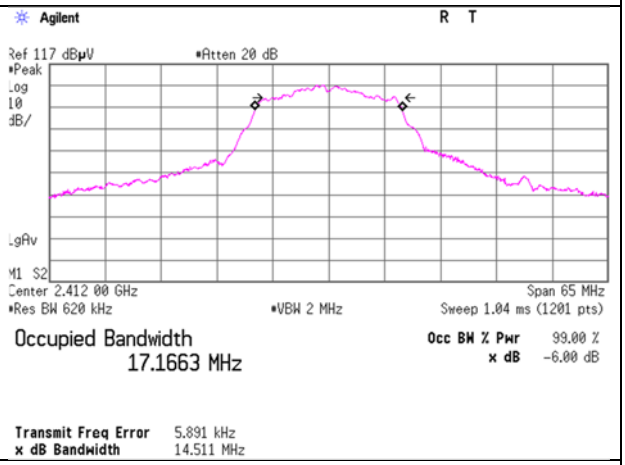
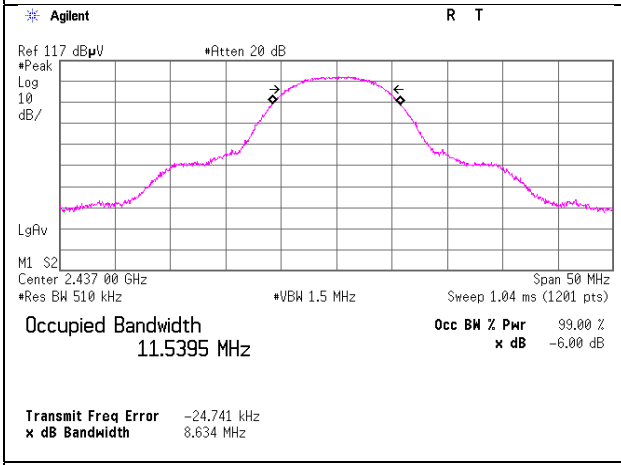
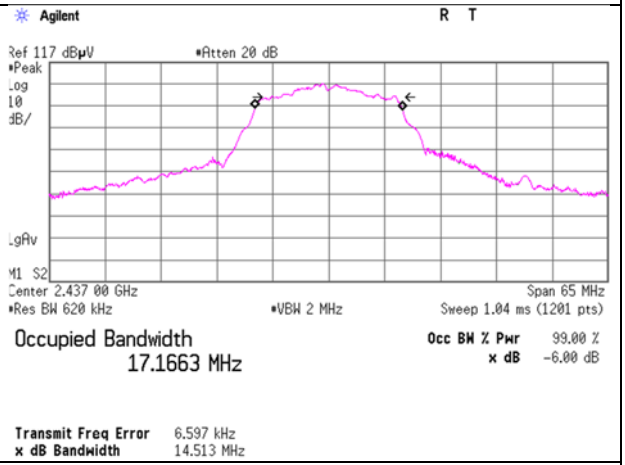
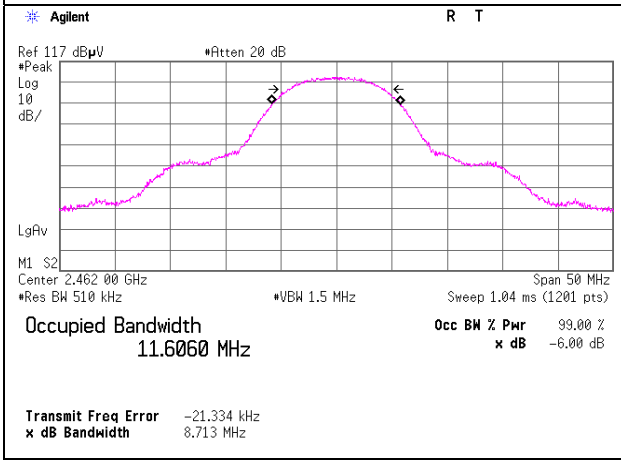
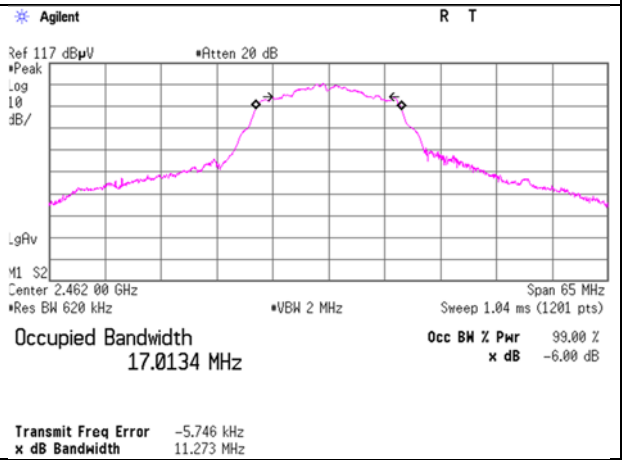
Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	11523.000	7.966	> 0.5000
	2437	11539.500	7.991	> 0.5000
	2462	11606.000	8.340	> 0.5000
11g	2412	17166.300	15.188	> 0.5000
	2437	17166.300	15.199	> 0.5000
	2462	17013.400	15.184	> 0.5000
11n-20	2412	18141.600	16.539	> 0.5000
	2437	18060.900	16.910	> 0.5000
	2462	17999.900	15.173	> 0.5000
11n-40	2422	36492.000	35.231	> 0.5000
	2437	36485.800	35.230	> 0.5000
	2452	36469.700	35.232	> 0.5000

6 dB Bandwidth and 99 % Occupied Bandwidth

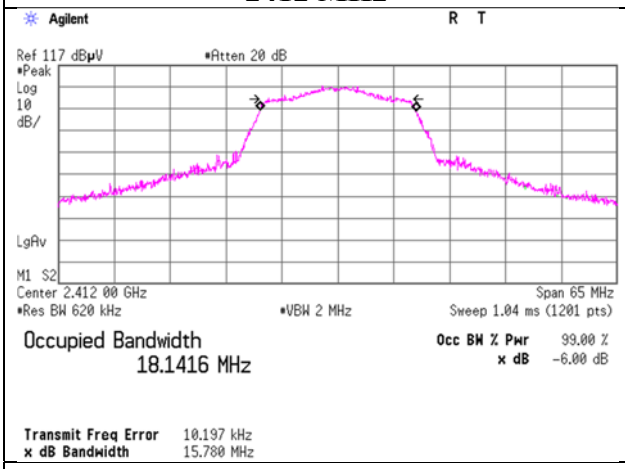
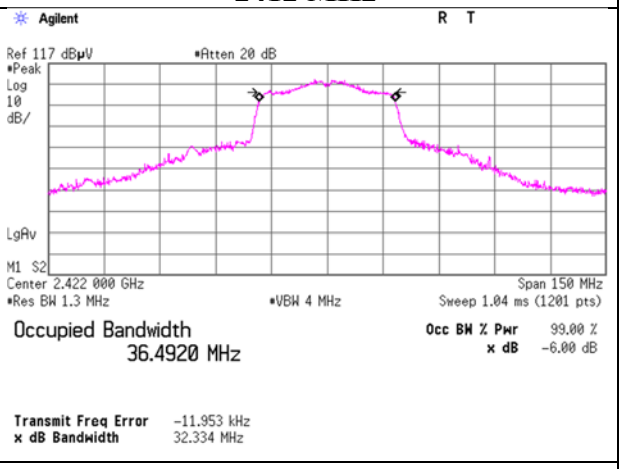
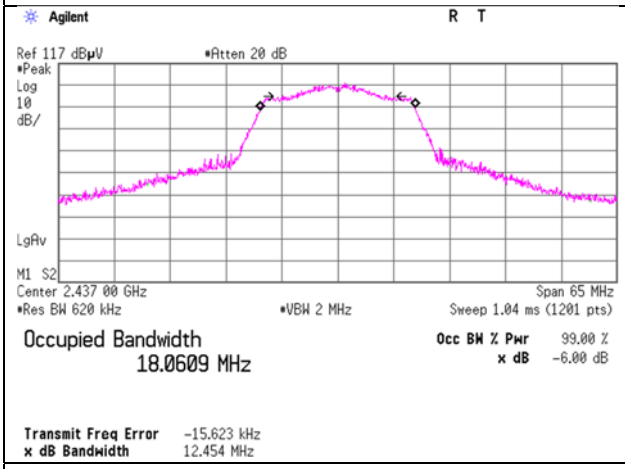
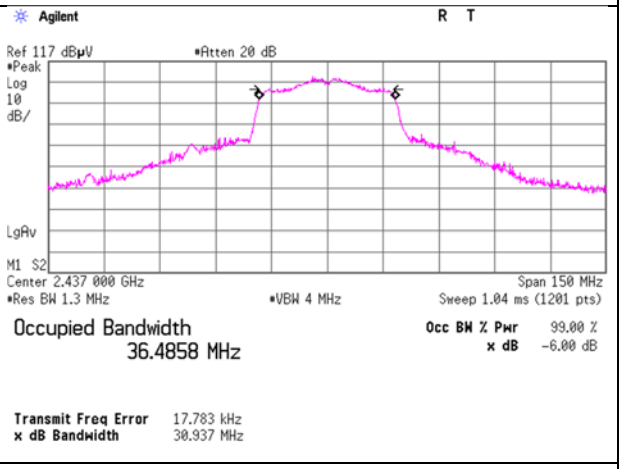
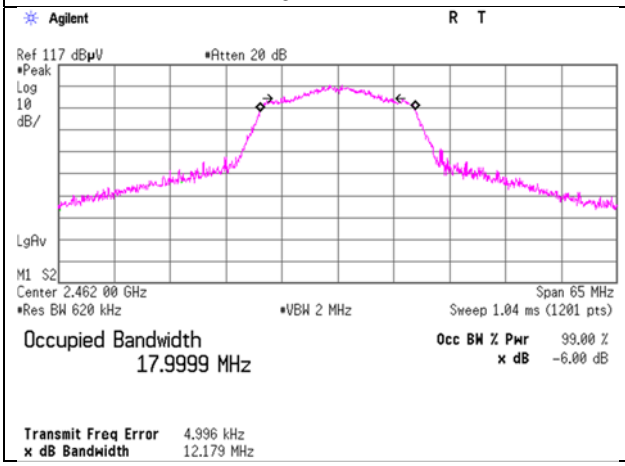
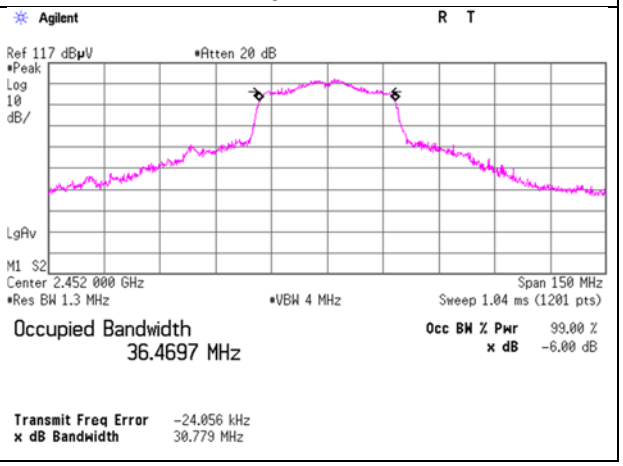
Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
BT LE	2402	1059.600	0.709	> 0.5000
	2440	1061.400	0.712	> 0.5000
	2480	1064.800	0.702	> 0.5000

99%Occupied Bandwidth

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

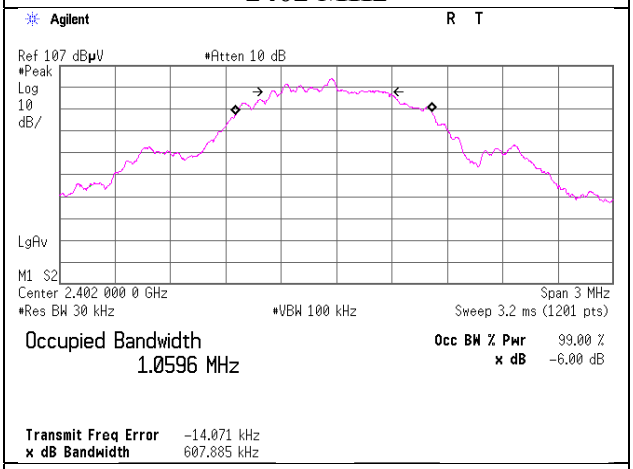
99% Occupied Bandwidth

11n-20	11n-40
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

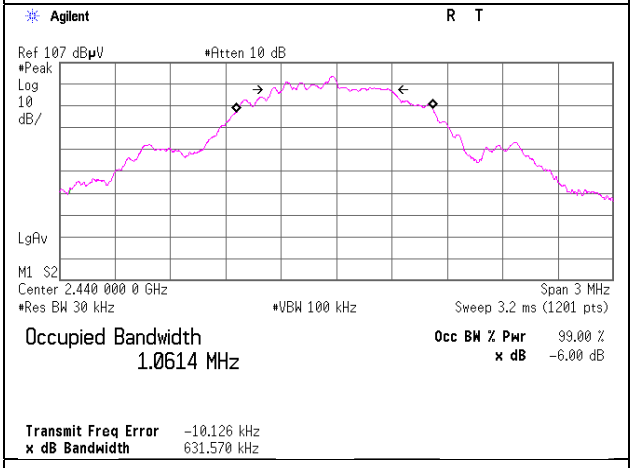
99% Occupied Bandwidth

BT LE

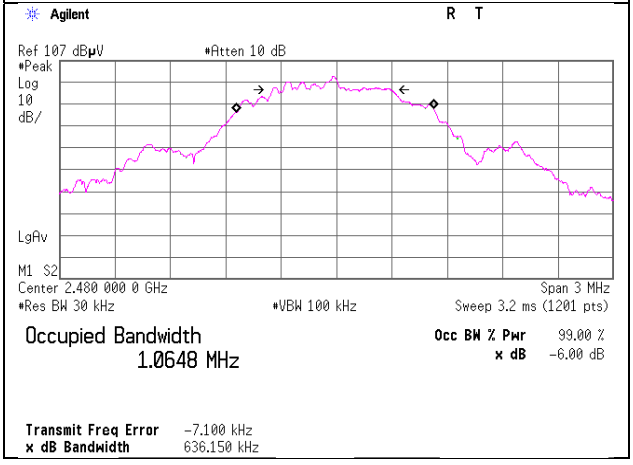
2402 MHz



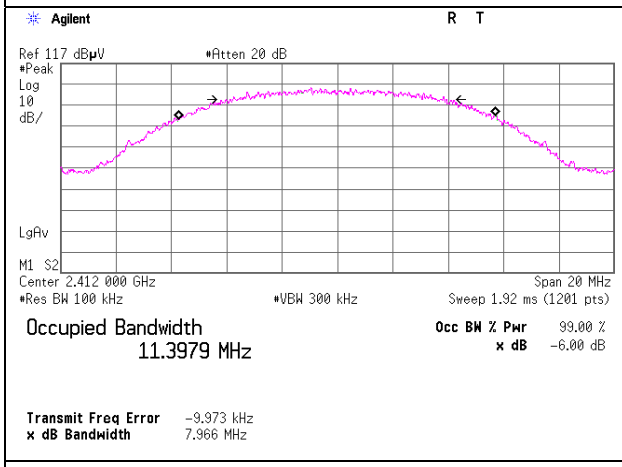
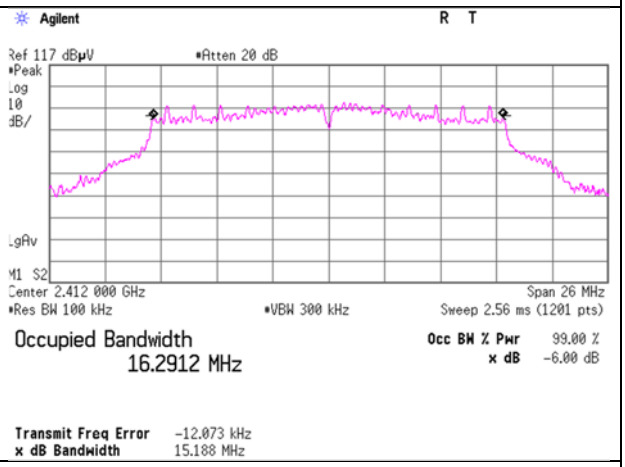
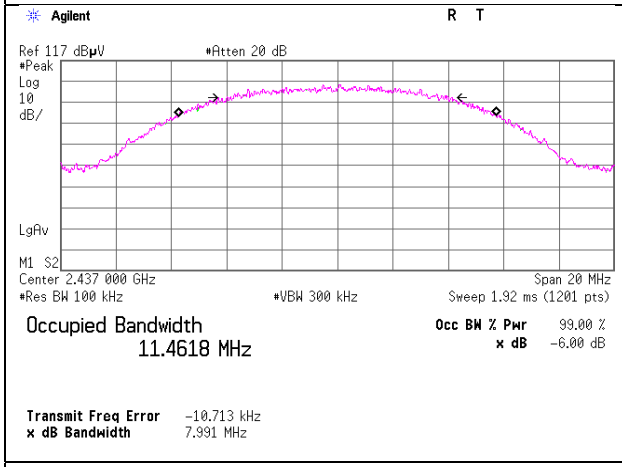
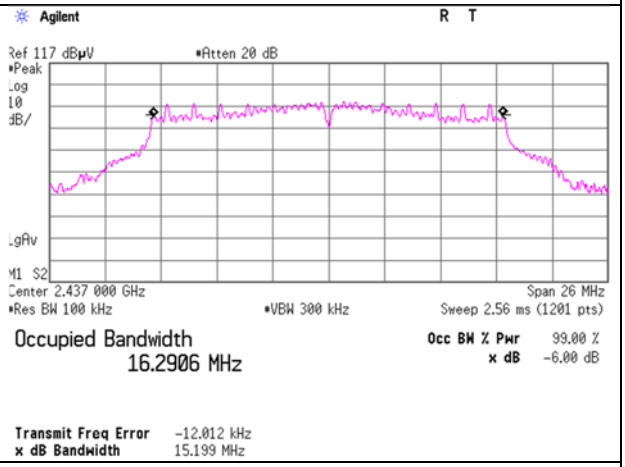
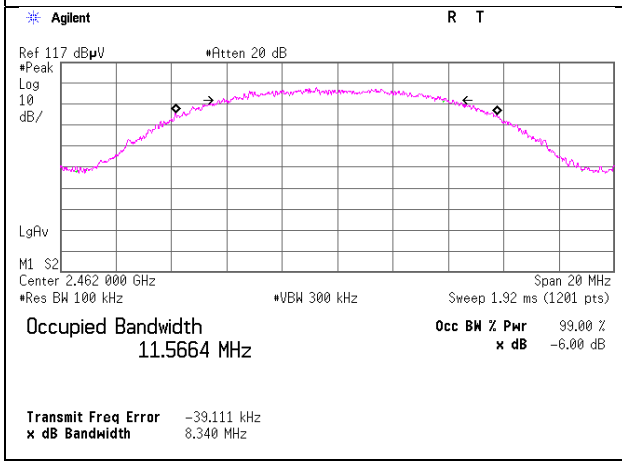
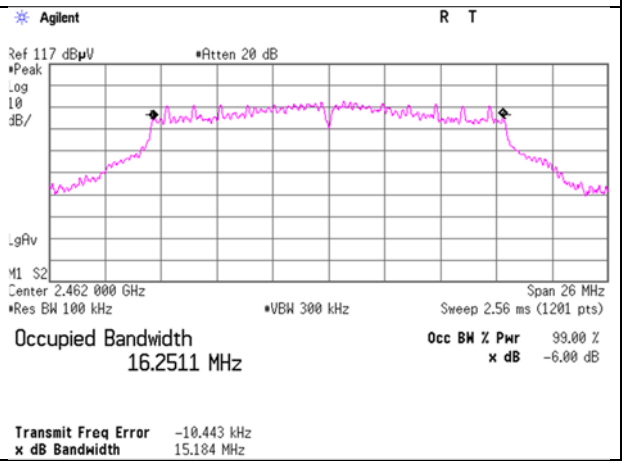
2440 MHz



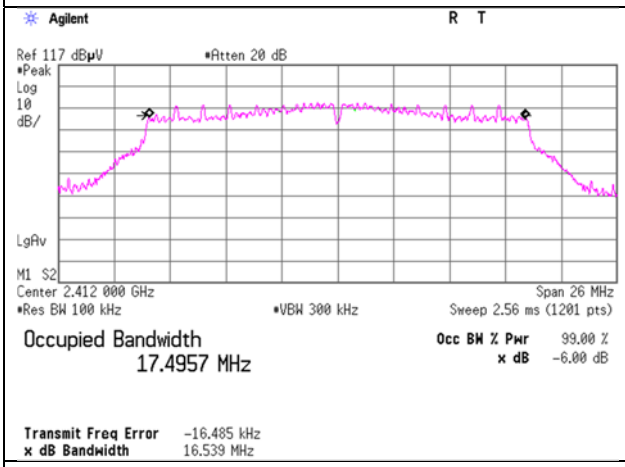
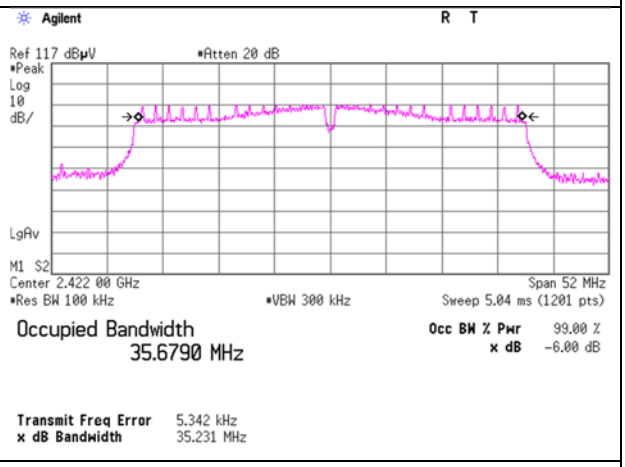
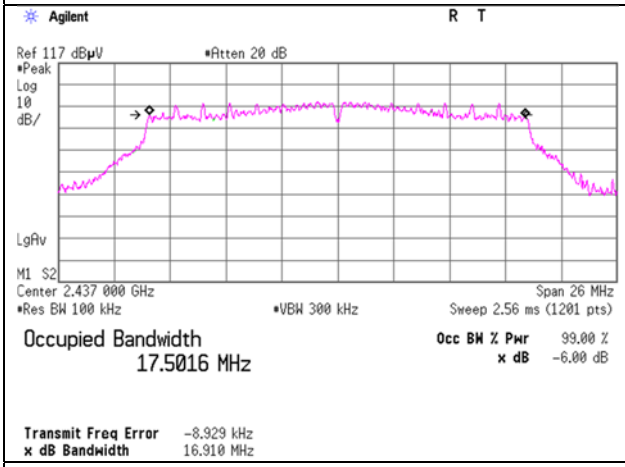
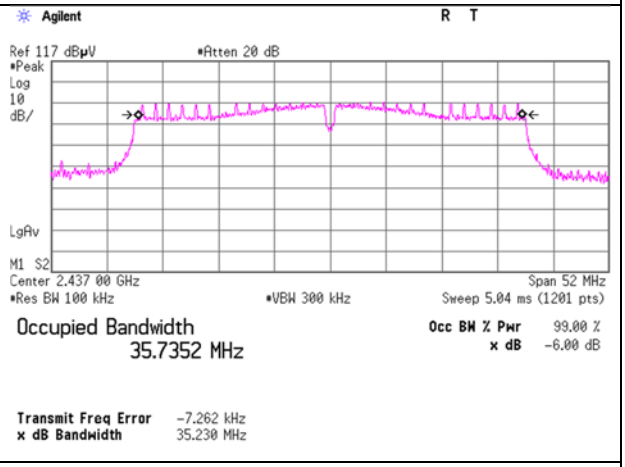
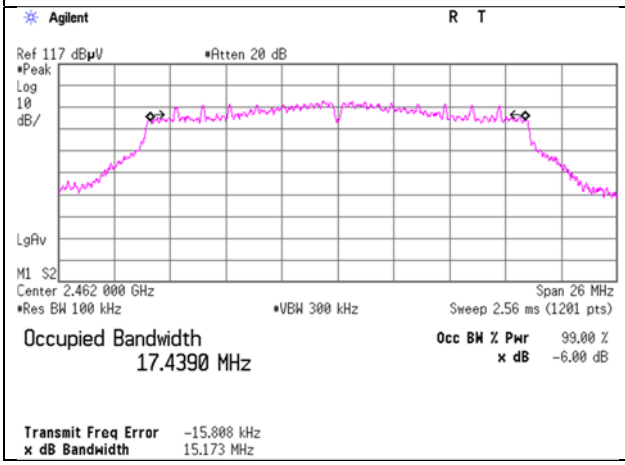
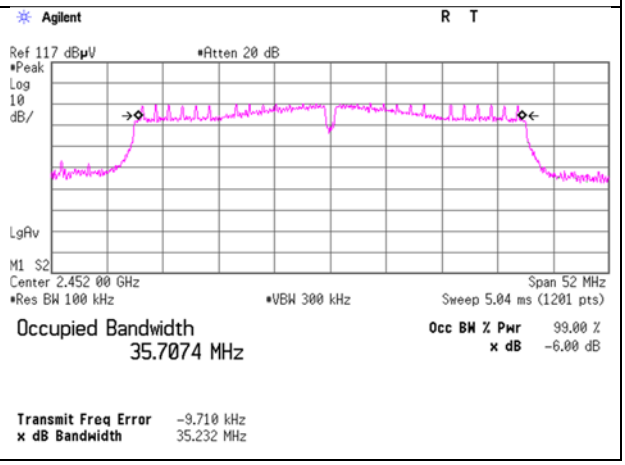
2480 MHz



6dB Bandwidth

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

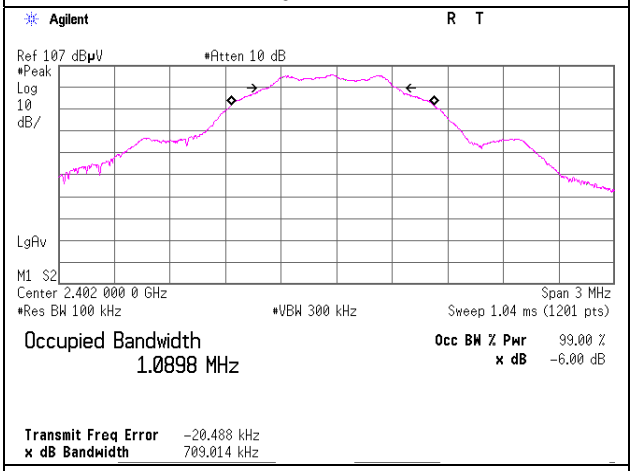
6dB Bandwidth

11n-20	11n-40
2412 MHz	**2422 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2452 MHz**
	

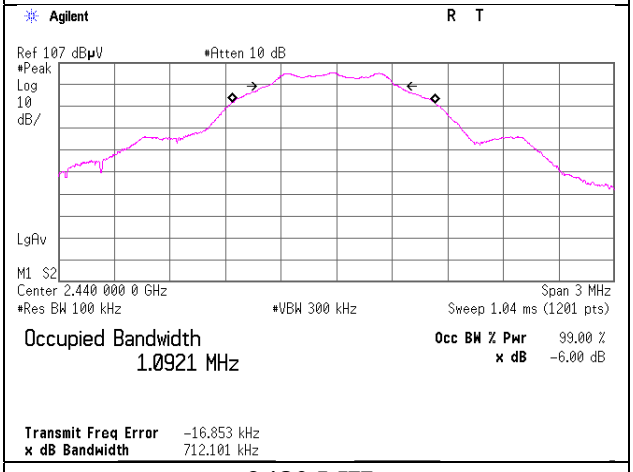
6dB Bandwidth

BT LE

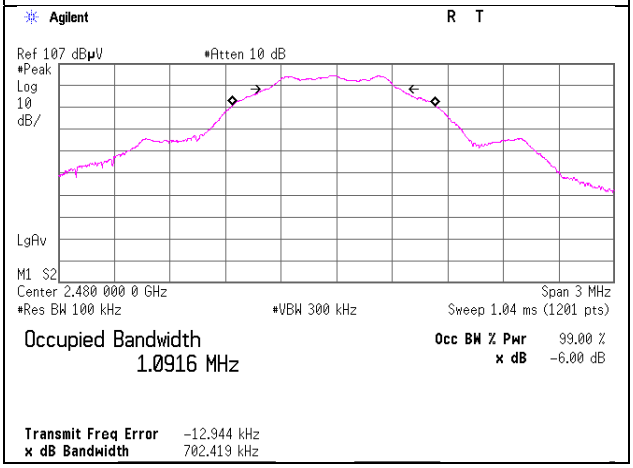
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Report No.	12475916H
Test place	Ise EMC Lab. No.7 Shielded Room
Date	January 27, 2019
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Tomoki Matsui
Mode	Tx 11b

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	8.71	0.40	10.06	19.17	82.60	30.00	1000	10.83	0.60	19.77	94.84	36.02	4000	16.25
2437	8.58	0.40	10.06	19.04	80.17	30.00	1000	10.96	0.60	19.64	92.04	36.02	4000	16.38
2462	8.49	0.40	10.06	18.95	78.52	30.00	1000	11.05	0.60	19.55	90.16	36.02	4000	16.47

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	19.16	
2	19.56	
5.5	19.51	
11	19.65	*

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

*Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Report No.	12475916H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	January 18, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Junki Nagatomi
Mode	Tx 11g

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	13.86	1.31	10.06	25.23	333.43	30.00	1000	4.77	0.60	25.83	382.82	36.02	4000	10.19
2437	13.71	1.32	10.06	25.09	322.85	30.00	1000	4.91	0.60	25.69	370.68	36.02	4000	10.33
2462	13.62	1.32	10.06	25.00	316.23	30.00	1000	5.00	0.60	25.60	363.08	36.02	4000	10.42

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	22.80	
9	23.04	
12	22.95	
18	22.81	
24	22.74	
36	22.47	
48	23.25	*
54	22.39	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

*Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Report No.	12475916H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	January 18, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Junki Nagatomi
Mode	Tx 11n-20

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	13.89	1.31	10.06	25.26	335.74	30.00	1000	4.74	0.60	25.86	385.48	36.02	4000	10.16
2437	13.79	1.32	10.06	25.17	328.85	30.00	1000	4.83	0.60	25.77	377.57	36.02	4000	10.25
2462	13.67	1.32	10.06	25.05	319.89	30.00	1000	4.95	0.60	25.65	367.28	36.02	4000	10.37

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437 MHz, Long GI

MCS Number	Reading [dBm]	Remark
0	23.23	
1	23.31	
2	23.14	
3	23.35	*
4	23.08	
5	23.03	
6	23.15	
7	23.20	

* Worst Conditioin
All comparison were carried out on same frequency and measurement factors.

*Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Report No.	12475916H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	January 18, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Junki Nagatomi
Mode	Tx 11n-40

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2422	14.06	1.31	10.06	25.43	349.14	30.00	1000	4.57	0.60	26.03	400.87	36.02	4000	9.99
2437	13.97	1.32	10.06	25.35	342.77	30.00	1000	4.65	0.60	25.95	393.55	36.02	4000	10.07
2452	13.86	1.32	10.06	25.24	334.20	30.00	1000	4.76	0.60	25.84	383.71	36.02	4000	10.18

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437 MHz, Long GI

MCS Number	Reading [dBm]	Remark
0	23.15	
1	22.83	
2	23.17	*
3	23.03	
4	23.13	
5	23.11	
6	22.88	
7	23.10	

* Worst Conditioin
All comparison were carried out on same frequency and measurement factors.

*Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-4.30	0.40	10.10	6.20	4.17	30.00	1000	23.80	0.60	6.80	4.79	36.02	4000	29.22
2440	-4.38	0.40	10.10	6.12	4.09	30.00	1000	23.88	0.60	6.72	4.70	36.02	4000	29.30
2480	-5.01	0.40	10.10	5.49	3.54	30.00	1000	24.51	0.60	6.09	4.06	36.02	4000	29.93

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

Average Output Power
(Reference data for RF Exposure / SAR testing)

Report No.	12475916H
Test place	Ise EMC Lab. No.8 Measurement Room
Date	October 23, 2018
Temperature / Humidity	24 deg. C / 51 % RH
Engineer	Takumi Shimada
Mode	Tx

11b **1 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	5.47	0.40	10.06	15.93	39.17	0.04	15.97	39.54
2437	5.37	0.40	10.06	15.83	38.28	0.04	15.87	38.64
2462	5.34	0.40	10.06	15.80	38.02	0.04	15.84	38.37

11g **6 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	3.72	0.70	10.11	14.53	28.38	0.26	14.79	30.13
2437	3.59	0.70	10.11	14.40	27.54	0.26	14.66	29.24
2462	3.51	0.70	10.11	14.32	27.04	0.26	14.58	28.71

11n-20 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	3.21	0.70	10.11	14.02	25.23	0.31	14.33	27.10
2437	2.97	0.70	10.11	13.78	23.88	0.31	14.09	25.64
2462	2.86	0.70	10.11	13.67	23.28	0.31	13.98	25.00

11n-40 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2422	4.14	0.70	10.11	14.95	31.26	0.60	15.55	35.89
2437	4.06	0.70	10.11	14.87	30.69	0.60	15.47	35.24
2452	3.86	0.70	10.11	14.67	29.31	0.60	15.27	33.65

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

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

Average Output Power
(Reference data for RF Exposure / SAR testing)

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-6.64	0.40	10.10	3.86	2.43	1.94	5.80	3.80
2440	-6.76	0.40	10.10	3.74	2.37	1.94	5.68	3.70
2480	-7.41	0.40	10.10	3.09	2.04	1.94	5.03	3.18

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

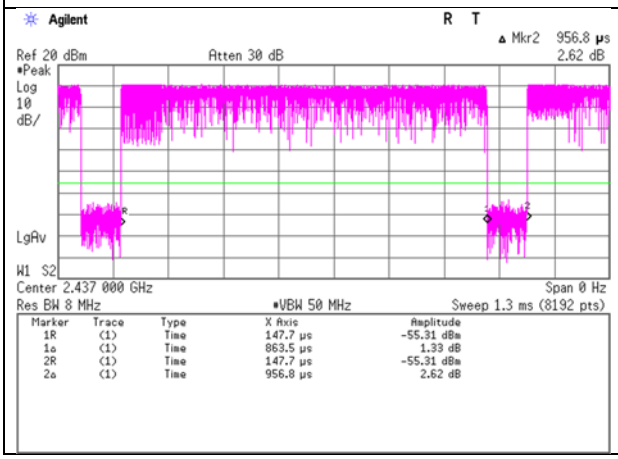
The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Burst rate confirmation

Report No.	12475916H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	October 13, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Akihiko Maeda
Mode	Tx

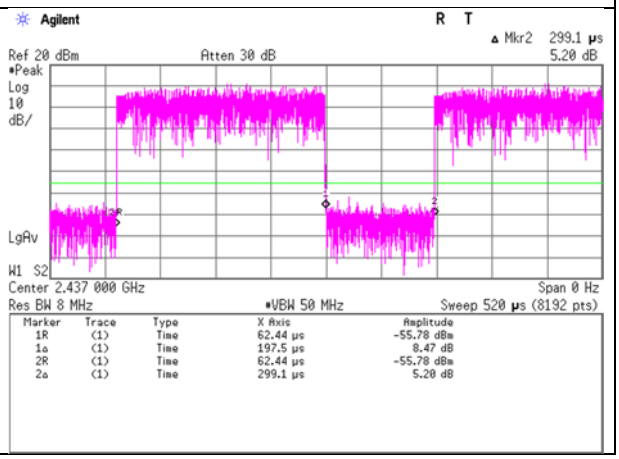
11b 11 Mbps

Tx on / (Tx on + Tx off) =	0.902
Tx on / (Tx on + Tx off) * 100 =	90.2 %
Duty factor = 10 * log (956.8 / 863.5) =	0.45 dB



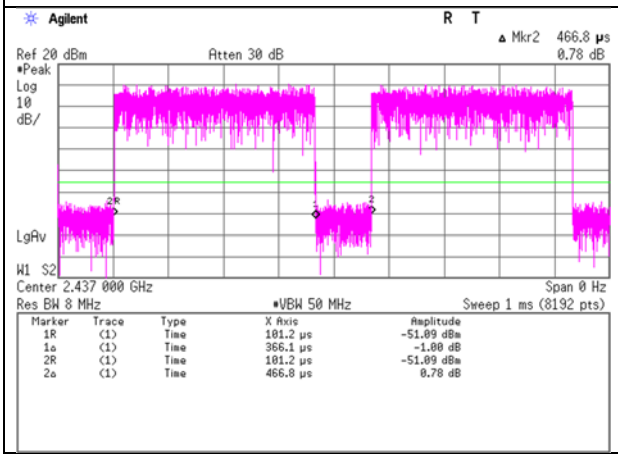
11g 48 Mbps

Tx on / (Tx on + Tx off) =	0.660
Tx on / (Tx on + Tx off) * 100 =	66.0 %
Duty factor = 10 * log (299.1 / 197.5) =	1.80 dB



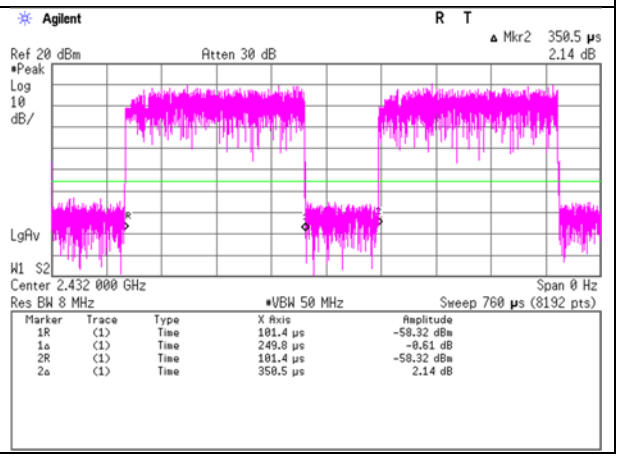
11n-20 MCS 3

Tx on / (Tx on + Tx off) =	0.784
Tx on / (Tx on + Tx off) * 100 =	78.4 %
Duty factor = 10 * log (466.8 / 366.1) =	1.06 dB



11n-40 MCS 2

Tx on / (Tx on + Tx off) =	0.713
Tx on / (Tx on + Tx off) * 100 =	71.3 %
Duty factor = 10 * log (350.5 / 249.8) =	1.47 dB

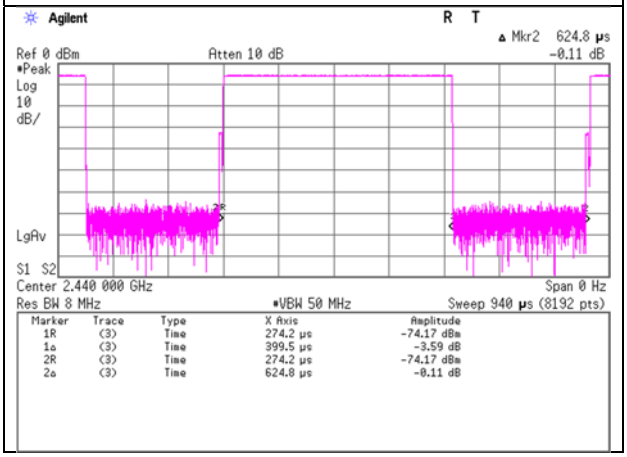


Burst rate confirmation

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE

Tx on / (Tx on + Tx off) =	**0.639**
Tx on / (Tx on + Tx off) * 100 =	**63.9 %**
Duty factor = 10 * log (624.8 / 399.5) =	**1.94 dB**



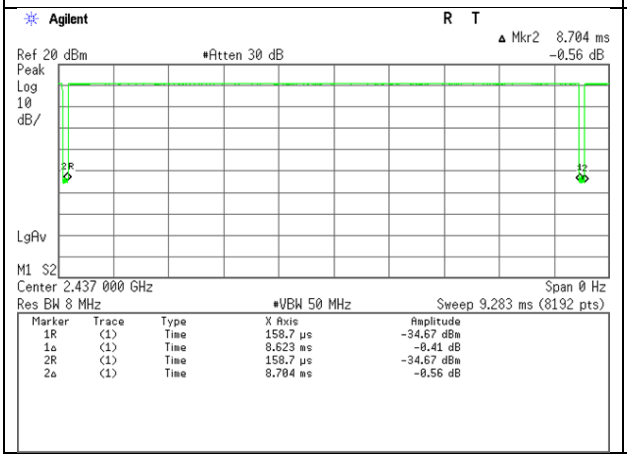
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Report No.	12475916H
Test place	Ise EMC Lab. No.8 Measurement Room
Date	October 23, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Takumi Shimada
Mode	Tx

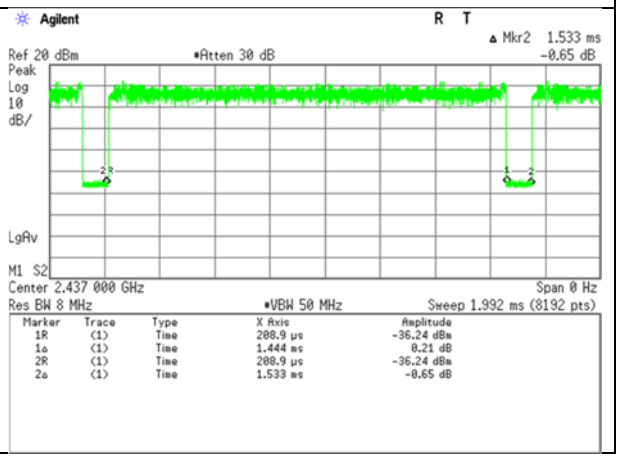
11b 1 Mbps

Tx on / (Tx on + Tx off) =	0.991
Tx on / (Tx on + Tx off) * 100 =	99.1 %
Duty factor = 10 * log (8704 / 8623) =	0.04 dB



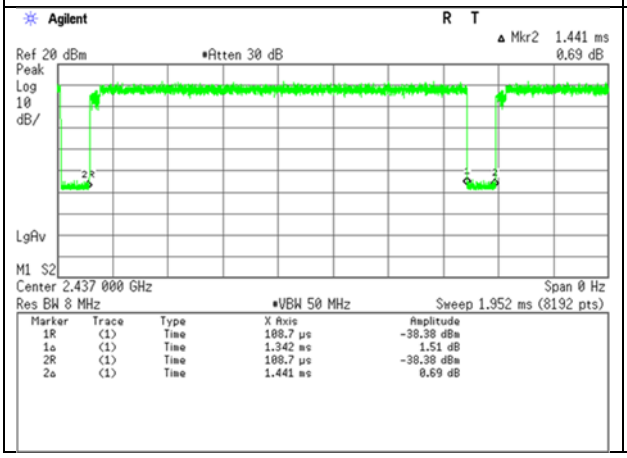
11g 6 Mbps

Tx on / (Tx on + Tx off) =	0.942
Tx on / (Tx on + Tx off) * 100 =	94.2 %
Duty factor = 10 * log (1533 / 1444) =	0.26 dB



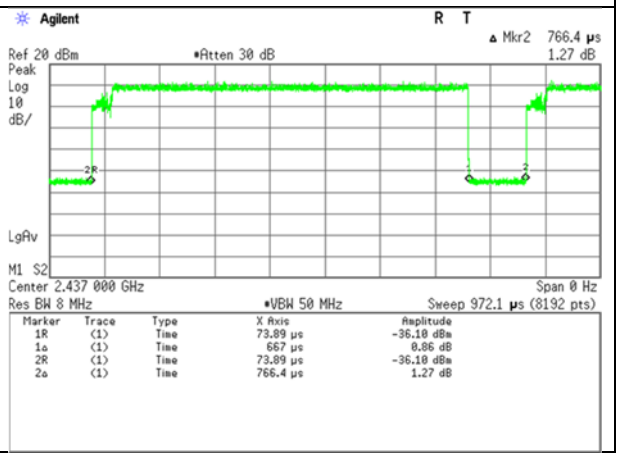
11n-20 MCS 0

Tx on / (Tx on + Tx off) =	0.931
Tx on / (Tx on + Tx off) * 100 =	93.1 %
Duty factor = 10 * log (1441 / 1342) =	0.31 dB



11n-40 MCS 0

Tx on / (Tx on + Tx off) =	0.870
Tx on / (Tx on + Tx off) * 100 =	87.0 %
Duty factor = 10 * log (766.4 / 667) =	0.60 dB



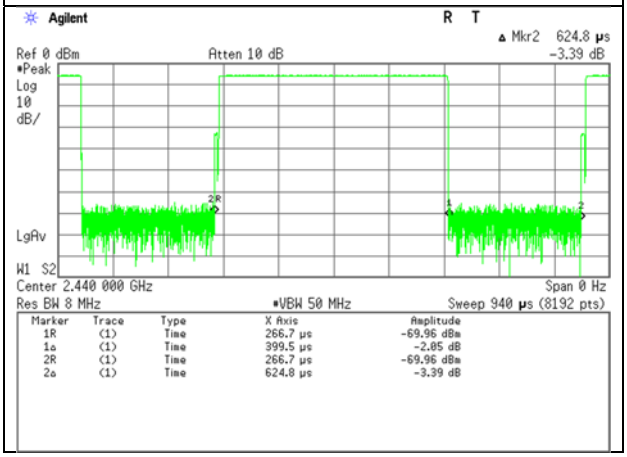
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE

Tx on / (Tx on + Tx off) =	**0.639**
Tx on / (Tx on + Tx off) * 100 =	**63.9 %**
Duty factor = 10 * log (624.8 / 399.5) =	**1.94 dB**



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

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 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	1930.513	PK	49.7	26.2	5.5	32.4	-	49.0	73.9	24.9	
Hori	2227.496	PK	46.0	27.8	5.7	32.2	-	47.3	73.9	26.6	
Hori	2390.000	PK	47.4	27.6	5.9	32.1	-	48.8	73.9	25.1	
Hori	4455.015	PK	46.0	30.7	7.0	31.4	-	52.3	73.9	21.6	
Hori	4824.000	PK	40.8	31.4	8.1	31.3	-	49.0	73.9	24.9	Floor noise
Hori	5940.032	PK	46.0	32.6	8.4	31.5	-	55.5	73.9	18.4	
Hori	7236.000	PK	42.3	36.2	9.1	32.4	-	55.2	73.9	18.7	Floor noise
Hori	9648.000	PK	42.1	38.0	10.4	32.6	-	57.9	73.9	16.0	Floor noise
Hori	1930.513	AV	43.4	26.2	5.5	32.4	-	42.7	53.9	11.2	
Hori	2227.496	AV	37.2	27.8	5.7	32.2	-	38.5	53.9	15.4	
Hori	2390.000	AV	38.4	27.6	5.9	32.1	0.5	40.3	53.9	13.7	*1)
Hori	4455.015	AV	39.8	30.7	7.0	31.4	0.5	46.6	53.9	7.3	
Hori	4824.000	AV	32.5	31.4	8.1	31.3	-	40.7	53.9	13.2	Floor noise
Hori	5940.032	AV	39.2	32.6	8.4	31.5	0.5	49.2	53.9	4.7	
Hori	7236.000	AV	33.5	36.2	9.1	32.4	-	46.4	53.9	7.5	Floor noise
Hori	9648.000	AV	32.0	38.0	10.4	32.6	-	47.8	53.9	6.1	Floor noise
Vert	1930.513	PK	49.6	26.2	5.5	32.4	-	48.9	73.9	25.0	
Vert	2227.496	PK	49.0	27.8	5.7	32.2	-	50.3	73.9	23.6	
Vert	2390.000	PK	48.2	27.6	5.9	32.1	-	49.6	73.9	24.3	
Vert	4455.015	PK	46.0	30.7	7.0	31.4	-	52.3	73.9	21.6	
Vert	4824.000	PK	40.4	31.4	8.1	31.3	-	48.6	73.9	25.3	Floor noise
Vert	5940.032	PK	44.5	32.6	8.4	31.5	-	54.0	73.9	19.9	
Vert	7236.000	PK	42.4	36.2	9.1	32.4	-	55.3	73.9	18.6	Floor noise
Vert	9648.000	PK	43.2	38.0	10.4	32.6	-	59.0	73.9	14.9	Floor noise
Vert	1930.513	AV	42.0	26.2	5.5	32.4	-	41.3	53.9	12.6	
Vert	2227.496	AV	41.8	27.8	5.7	32.2	-	43.1	53.9	10.8	
Vert	2390.000	AV	39.4	27.6	5.9	32.1	0.5	41.3	53.9	12.7	*1)
Vert	4455.015	AV	39.1	30.7	7.0	31.4	0.5	45.9	53.9	8.0	
Vert	4824.000	AV	32.7	31.4	8.1	31.3	-	40.9	53.9	13.0	Floor noise
Vert	5940.032	AV	36.2	32.6	8.4	31.5	0.5	46.2	53.9	7.7	
Vert	7236.000	AV	34.1	36.2	9.1	32.4	-	47.0	53.9	6.9	Floor noise
Vert	9648.000	AV	32.0	38.0	10.4	32.6	-	47.8	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

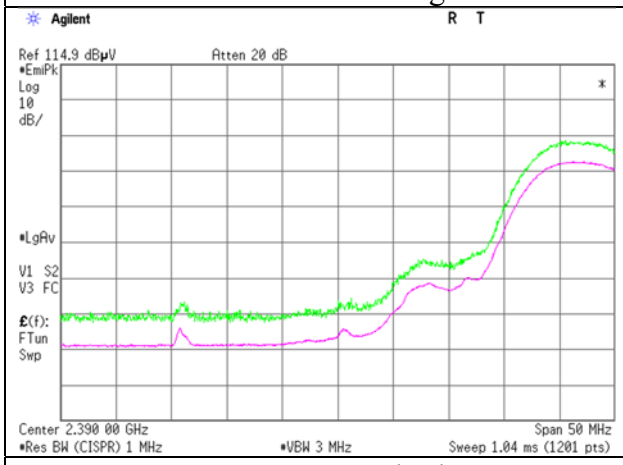
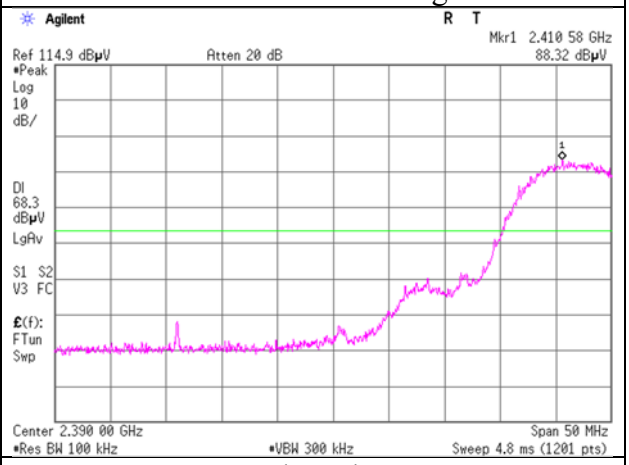
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	88.3	27.5	5.9	32.1	89.6	-	-	Carrier
Hori	2400.000	PK	51.8	27.6	5.9	32.1	53.2	69.6	16.4	
Vert	2412.000	PK	89.7	27.5	5.9	32.1	91.0	-	-	Carrier
Vert	2400.000	PK	53.2	27.6	5.9	32.1	54.6	71.0	16.4	

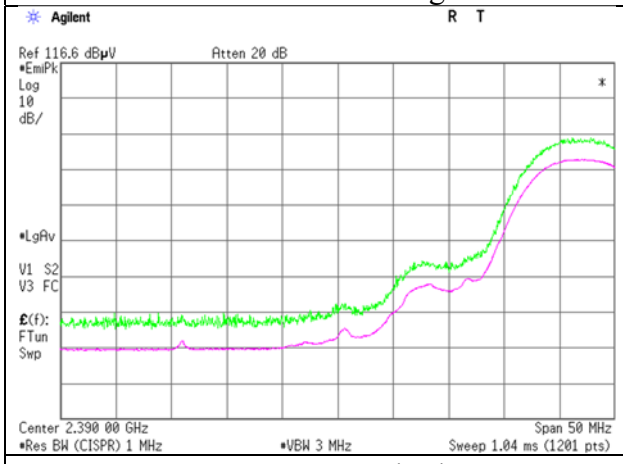
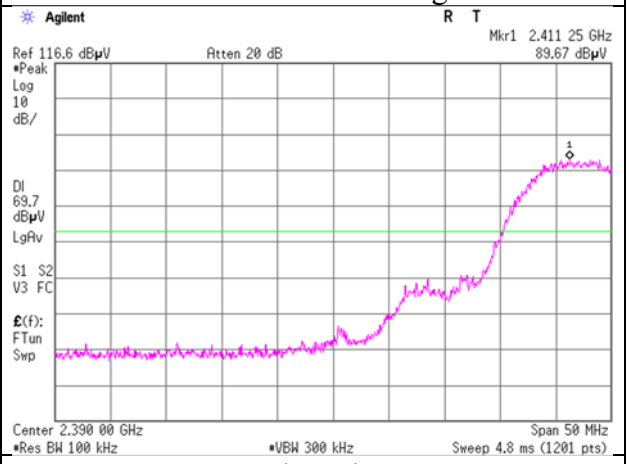
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 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.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	21 deg. C / 68 % RH
Engineer	Akihiko Maeda
	(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

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

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 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	1930.513	PK	49.1	26.2	5.5	32.4	-	48.4	73.9	25.5	
Hori	2227.496	PK	48.3	27.8	5.7	32.2	-	49.6	73.9	24.3	
Hori	4455.015	PK	44.1	30.7	7.0	31.4	-	50.4	73.9	23.5	
Hori	4874.000	PK	41.3	31.5	8.1	31.3	-	49.6	73.9	24.3	Floor noise
Hori	5940.032	PK	46.5	32.6	8.4	31.5	-	56.0	73.9	17.9	
Hori	7311.000	PK	42.2	36.3	9.1	32.4	-	55.2	73.9	18.7	Floor noise
Hori	9748.000	PK	41.0	38.3	10.4	32.7	-	57.0	73.9	16.9	Floor noise
Hori	1930.513	AV	42.4	26.2	5.5	32.4	-	41.7	53.9	12.2	
Hori	2227.496	AV	39.7	27.8	5.7	32.2	-	41.0	53.9	12.9	
Hori	4455.015	AV	37.3	30.7	7.0	31.4	0.5	44.1	53.9	9.8	
Hori	4874.000	AV	32.6	31.5	8.1	31.3	-	40.9	53.9	13.0	Floor noise
Hori	5940.032	AV	39.4	32.6	8.4	31.5	0.5	49.4	53.9	4.5	
Hori	7311.000	AV	33.8	36.3	9.1	32.4	-	46.8	53.9	7.1	Floor noise
Hori	9748.000	AV	31.8	38.3	10.4	32.7	-	47.8	53.9	6.1	Floor noise
Vert	1930.513	PK	48.9	26.2	5.5	32.4	-	48.2	73.9	25.7	
Vert	2227.496	PK	49.7	27.8	5.7	32.2	-	51.0	73.9	22.9	
Vert	4455.015	PK	45.3	30.7	7.0	31.4	-	51.6	73.9	22.3	
Vert	4874.000	PK	41.5	31.5	8.1	31.3	-	49.8	73.9	24.1	Floor noise
Vert	5940.032	PK	45.2	32.6	8.4	31.5	-	54.7	73.9	19.2	
Vert	7311.000	PK	41.1	36.3	9.1	32.4	-	54.1	73.9	19.8	Floor noise
Vert	9748.000	PK	41.8	38.3	10.4	32.7	-	57.8	73.9	16.1	Floor noise
Vert	1930.513	AV	39.8	26.2	5.5	32.4	-	39.1	53.9	14.8	
Vert	2227.496	AV	42.2	27.8	5.7	32.2	-	43.5	53.9	10.4	
Vert	4455.015	AV	38.4	30.7	7.0	31.4	0.5	45.2	53.9	8.7	
Vert	4874.000	AV	32.4	31.5	8.1	31.3	-	40.7	53.9	13.2	Floor noise
Vert	5940.032	AV	37.1	32.6	8.4	31.5	0.5	47.1	53.9	6.8	
Vert	7311.000	AV	33.7	36.3	9.1	32.4	-	46.7	53.9	7.2	Floor noise
Vert	9748.000	AV	31.9	38.3	10.4	32.7	-	47.9	53.9	6.0	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 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	1930.513	PK	49.8	26.2	5.5	32.4	-	49.1	73.9	24.8	
Hori	2227.496	PK	45.6	27.8	5.7	32.2	-	46.9	73.9	27.0	
Hori	2483.500	PK	44.8	27.5	5.9	32.0	-	46.2	73.9	27.7	
Hori	4455.015	PK	48.0	30.7	7.0	31.4	-	54.3	73.9	19.6	
Hori	4924.000	PK	41.0	31.6	8.1	31.2	-	49.5	73.9	24.4	Floor noise
Hori	5940.032	PK	45.9	32.6	8.4	31.5	-	55.4	73.9	18.5	
Hori	7386.000	PK	42.8	36.3	9.1	32.5	-	55.7	73.9	18.2	Floor noise
Hori	9848.000	PK	42.5	38.4	10.5	32.7	-	58.7	73.9	15.2	Floor noise
Hori	1930.513	AV	43.5	26.2	5.5	32.4	-	42.8	53.9	11.1	
Hori	2227.496	AV	36.9	27.8	5.7	32.2	-	38.2	53.9	15.7	
Hori	2483.500	AV	35.3	27.5	5.9	32.0	0.5	37.2	53.9	16.8	*1)
Hori	4455.015	AV	39.5	30.7	7.0	31.4	0.5	46.3	53.9	7.6	
Hori	4924.000	AV	32.2	31.6	8.1	31.2	-	40.7	53.9	13.2	Floor noise
Hori	5940.032	AV	39.0	32.6	8.4	31.5	0.5	49.0	53.9	4.9	
Hori	7386.000	AV	33.9	36.3	9.1	32.5	-	46.8	53.9	7.1	Floor noise
Hori	9848.000	AV	31.4	38.4	10.5	32.7	-	47.6	53.9	6.3	Floor noise
Vert	1930.513	PK	50.1	26.2	5.5	32.4	-	49.4	73.9	24.5	
Vert	2227.496	PK	49.1	27.8	5.7	32.2	-	50.4	73.9	23.5	
Vert	2483.500	PK	45.9	27.5	5.9	32.0	-	47.3	73.9	26.6	
Vert	4455.015	PK	45.9	30.7	7.0	31.4	-	52.2	73.9	21.7	
Vert	4924.000	PK	41.0	31.6	8.1	31.2	-	49.5	73.9	24.4	Floor noise
Vert	5940.032	PK	44.3	32.6	8.4	31.5	-	53.8	73.9	20.1	
Vert	7386.000	PK	42.3	36.3	9.1	32.5	-	55.2	73.9	18.7	Floor noise
Vert	9848.000	PK	43.1	38.4	10.5	32.7	-	59.3	73.9	14.6	Floor noise
Vert	1930.513	AV	41.5	26.2	5.5	32.4	-	40.8	53.9	13.1	
Vert	2227.496	AV	41.7	27.8	5.7	32.2	-	43.0	53.9	10.9	
Vert	2483.500	AV	35.4	27.5	5.9	32.0	0.5	37.3	53.9	16.7	*1)
Vert	4455.015	AV	39.2	30.7	7.0	31.4	0.5	46.0	53.9	7.9	
Vert	4924.000	AV	32.8	31.6	8.1	31.2	-	41.3	53.9	12.6	Floor noise
Vert	5940.032	AV	36.5	32.6	8.4	31.5	0.5	46.5	53.9	7.4	
Vert	7386.000	AV	33.9	36.3	9.1	32.5	-	46.8	53.9	7.1	Floor noise
Vert	9848.000	AV	31.2	38.4	10.5	32.7	-	47.4	53.9	6.5	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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

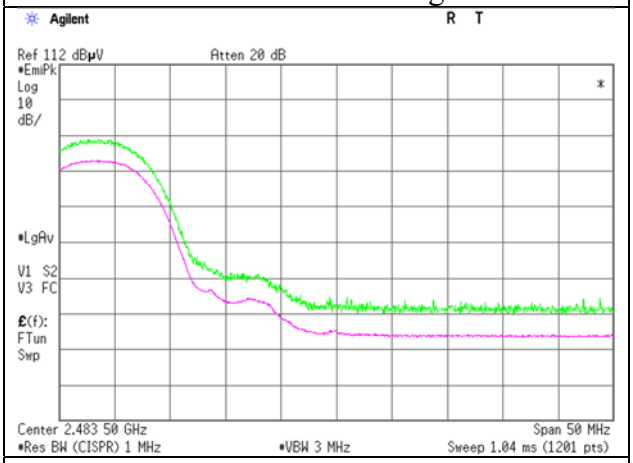
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	21 deg. C / 68 % RH
Engineer	Akihiko Maeda
	(1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

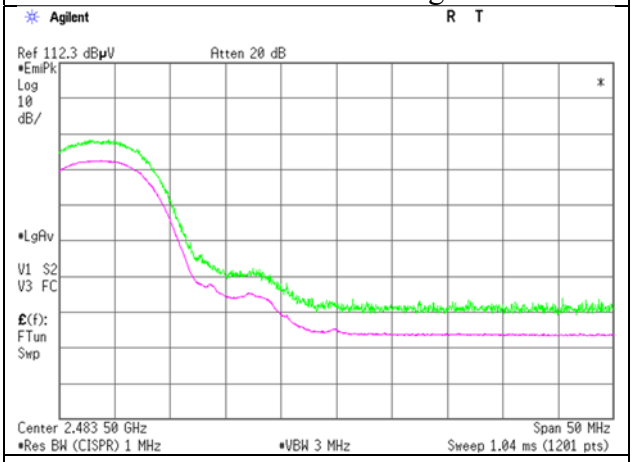
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 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	1930.513	PK	50.0	26.2	5.5	32.4	-	49.3	73.9	24.6	
Hori	2227.496	PK	46.1	27.8	5.7	32.2	-	47.4	73.9	26.5	
Hori	2390.000	PK	54.8	27.6	5.9	32.1	-	56.2	73.9	17.7	
Hori	4455.015	PK	45.9	30.7	7.0	31.4	-	52.2	73.9	21.7	
Hori	4824.000	PK	40.9	31.4	8.1	31.3	-	49.1	73.9	24.8	Floor noise
Hori	5940.032	PK	46.2	32.6	8.4	31.5	-	55.7	73.9	18.2	
Hori	7236.000	PK	42.4	36.2	9.1	32.4	-	55.3	73.9	18.6	Floor noise
Hori	9648.000	PK	42.1	38.0	10.4	32.6	-	57.9	73.9	16.0	Floor noise
Hori	1930.513	AV	43.3	26.2	5.5	32.4	-	42.6	53.9	11.3	
Hori	2227.496	AV	37.1	27.8	5.7	32.2	-	38.4	53.9	15.5	
Hori	2390.000	AV	41.4	27.6	5.9	32.1	1.1	43.9	53.9	10.0	*1)
Hori	4455.015	AV	40.0	30.7	7.0	31.4	1.1	47.4	53.9	6.5	
Hori	4824.000	AV	32.1	31.4	8.1	31.3	-	40.3	53.9	13.6	Floor noise
Hori	5940.032	AV	39.3	32.6	8.4	31.5	1.1	49.9	53.9	4.0	
Hori	7236.000	AV	33.6	36.2	9.1	32.4	-	46.5	53.9	7.4	Floor noise
Hori	9648.000	AV	32.0	38.0	10.4	32.6	-	47.8	53.9	6.1	Floor noise
Vert	1930.513	PK	49.8	26.2	5.5	32.4	-	49.1	73.9	24.8	
Vert	2227.496	PK	49.1	27.8	5.7	32.2	-	50.4	73.9	23.5	
Vert	2390.000	PK	53.3	27.6	5.9	32.1	-	54.7	73.9	19.2	
Vert	4455.015	PK	45.8	30.7	7.0	31.4	-	52.1	73.9	21.8	
Vert	4824.000	PK	40.4	31.4	8.1	31.3	-	48.6	73.9	25.3	Floor noise
Vert	5940.032	PK	44.3	32.6	8.4	31.5	-	53.8	73.9	20.1	
Vert	7236.000	PK	42.1	36.2	9.1	32.4	-	55.0	73.9	18.9	Floor noise
Vert	9648.000	PK	43.1	38.0	10.4	32.6	-	58.9	73.9	15.0	Floor noise
Vert	1930.513	AV	42.1	26.2	5.5	32.4	-	41.4	53.9	12.5	
Vert	2227.496	AV	42.0	27.8	5.7	32.2	-	43.3	53.9	10.6	
Vert	2390.000	AV	40.2	27.6	5.9	32.1	1.1	42.7	53.9	11.2	*1)
Vert	4455.015	AV	39.0	30.7	7.0	31.4	1.1	46.4	53.9	7.5	
Vert	4824.000	AV	32.6	31.4	8.1	31.3	-	40.8	53.9	13.1	Floor noise
Vert	5940.032	AV	36.0	32.6	8.4	31.5	1.1	46.6	53.9	7.3	
Vert	7236.000	AV	33.9	36.2	9.1	32.4	-	46.8	53.9	7.1	Floor noise
Vert	9648.000	AV	31.5	38.0	10.4	32.6	-	47.3	53.9	6.6	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 (4.0 m / 3.0 m) = 2.5 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

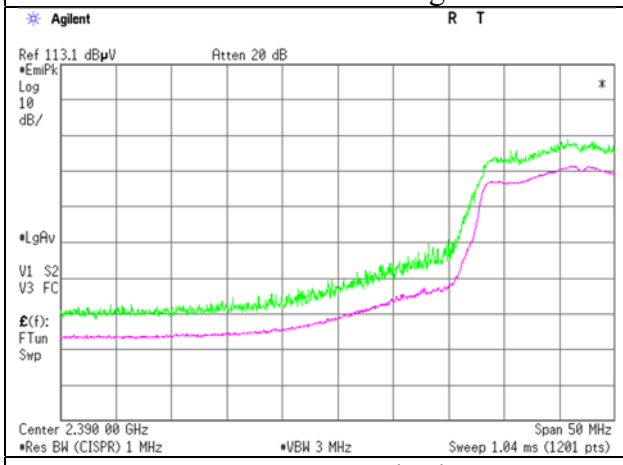
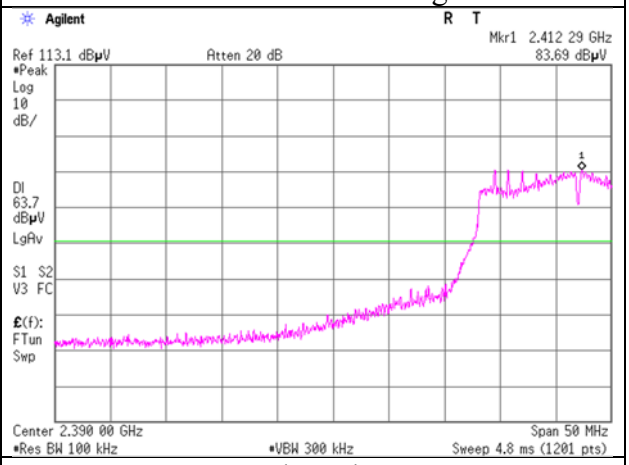
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	83.7	27.5	5.9	32.1	85.0	-	-	Carrier
Hori	2400.000	PK	50.8	27.6	5.9	32.1	52.2	65.0	12.8	
Vert	2412.000	PK	84.0	27.5	5.9	32.1	85.3	-	-	Carrier
Vert	2400.000	PK	49.6	27.6	5.9	32.1	51.0	65.3	14.3	

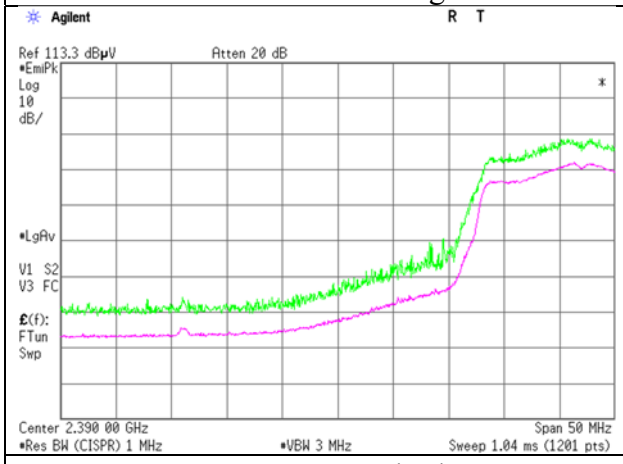
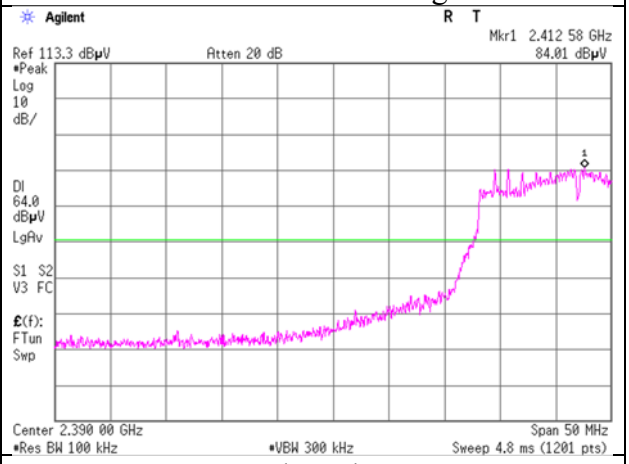
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 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.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	21 deg. C / 68 % RH
Engineer	Akihiko Maeda
	(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

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

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 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	1930.513	PK	49.1	26.2	5.5	32.4	-	48.4	73.9	25.5	
Hori	2227.496	PK	48.3	27.8	5.7	32.2	-	49.6	73.9	24.3	
Hori	4455.015	PK	44.2	30.7	7.0	31.4	-	50.5	73.9	23.4	
Hori	4874.000	PK	41.5	31.5	8.1	31.3	-	49.8	73.9	24.1	Floor noise
Hori	5940.032	PK	46.5	32.6	8.4	31.5	-	56.0	73.9	17.9	
Hori	7311.000	PK	42.6	36.3	9.1	32.4	-	55.6	73.9	18.3	Floor noise
Hori	9748.000	PK	41.7	38.3	10.4	32.7	-	57.7	73.9	16.2	Floor noise
Hori	1930.513	AV	42.4	26.2	5.5	32.4	-	41.7	53.9	12.2	
Hori	2227.496	AV	39.7	27.8	5.7	32.2	-	41.0	53.9	12.9	
Hori	4455.015	AV	36.4	30.7	7.0	31.4	1.1	43.8	53.9	10.1	
Hori	4874.000	AV	33.0	31.5	8.1	31.3	-	41.3	53.9	12.6	Floor noise
Hori	5940.032	AV	39.2	32.6	8.4	31.5	1.1	49.8	53.9	4.1	
Hori	7311.000	AV	33.6	36.3	9.1	32.4	-	46.6	53.9	7.3	Floor noise
Hori	9748.000	AV	31.9	38.3	10.4	32.7	-	47.9	53.9	6.0	Floor noise
Vert	1930.513	PK	49.1	26.2	5.5	32.4	-	48.4	73.9	25.5	
Vert	2227.496	PK	49.3	27.8	5.7	32.2	-	50.6	73.9	23.3	
Vert	4455.015	PK	45.8	30.7	7.0	31.4	-	52.1	73.9	21.8	
Vert	4874.000	PK	41.9	31.5	8.1	31.3	-	50.2	73.9	23.7	Floor noise
Vert	5940.032	PK	45.6	32.6	8.4	31.5	-	55.1	73.9	18.8	
Vert	7311.000	PK	41.9	36.3	9.1	32.4	-	54.9	73.9	19.0	Floor noise
Vert	9748.000	PK	41.3	38.3	10.4	32.7	-	57.3	73.9	16.6	Floor noise
Vert	1930.513	AV	39.8	26.2	5.5	32.4	-	39.1	53.9	14.8	
Vert	2227.496	AV	41.6	27.8	5.7	32.2	-	42.9	53.9	11.0	
Vert	4455.015	AV	38.9	30.7	7.0	31.4	1.1	46.3	53.9	7.6	
Vert	4874.000	AV	32.1	31.5	8.1	31.3	-	40.4	53.9	13.5	Floor noise
Vert	5940.032	AV	37.5	32.6	8.4	31.5	1.1	48.1	53.9	5.8	
Vert	7311.000	AV	33.4	36.3	9.1	32.4	-	46.4	53.9	7.5	Floor noise
Vert	9748.000	AV	31.6	38.3	10.4	32.7	-	47.6	53.9	6.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 2462 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	1930.513	PK	49.8	26.2	5.5	32.4	-	49.1	73.9	24.8	
Hori	2227.496	PK	45.6	27.8	5.7	32.2	-	46.9	73.9	27.0	
Hori	2483.500	PK	46.5	27.5	5.9	32.0	-	47.9	73.9	26.0	
Hori	4455.015	PK	48.1	30.7	7.0	31.4	-	54.4	73.9	19.5	
Hori	4924.000	PK	41.5	31.6	8.1	31.2	-	50.0	73.9	23.9	Floor noise
Hori	5940.032	PK	45.7	32.6	8.4	31.5	-	55.2	73.9	18.7	
Hori	7386.000	PK	42.8	36.3	9.1	32.5	-	55.7	73.9	18.2	Floor noise
Hori	9848.000	PK	42.5	38.4	10.5	32.7	-	58.7	73.9	15.2	Floor noise
Hori	1930.513	AV	43.5	26.2	5.5	32.4	-	42.8	53.9	11.1	
Hori	2227.496	AV	36.9	27.8	5.7	32.2	-	38.2	53.9	15.7	
Hori	2483.500	AV	35.2	27.5	5.9	32.0	1.1	37.7	53.9	16.2	*1)
Hori	4455.015	AV	38.6	30.7	7.0	31.4	1.1	46.0	53.9	7.9	
Hori	4924.000	AV	32.1	31.6	8.1	31.2	-	40.6	53.9	13.3	Floor noise
Hori	5940.032	AV	36.0	32.6	8.4	31.5	1.1	46.6	53.9	7.3	
Hori	7386.000	AV	33.8	36.3	9.1	32.5	-	46.7	53.9	7.2	Floor noise
Hori	9848.000	AV	31.5	38.4	10.5	32.7	-	47.7	53.9	6.2	Floor noise
Vert	1930.513	PK	49.7	26.2	5.5	32.4	-	49.0	73.9	24.9	
Vert	2227.496	PK	48.9	27.8	5.7	32.2	-	50.2	73.9	23.7	
Vert	2483.500	PK	45.7	27.5	5.9	32.0	-	47.1	73.9	26.8	
Vert	4455.015	PK	45.2	30.7	7.0	31.4	-	51.5	73.9	22.4	
Vert	4924.000	PK	41.0	31.6	8.1	31.2	-	49.5	73.9	24.4	Floor noise
Vert	5940.032	PK	44.2	32.6	8.4	31.5	-	53.7	73.9	20.2	
Vert	7386.000	PK	42.3	36.3	9.1	32.5	-	55.2	73.9	18.7	Floor noise
Vert	9848.000	PK	43.1	38.4	10.5	32.7	-	59.3	73.9	14.6	Floor noise
Vert	1930.513	AV	41.3	26.2	5.5	32.4	-	40.6	53.9	13.3	
Vert	2227.496	AV	41.3	27.8	5.7	32.2	-	42.6	53.9	11.3	
Vert	2483.500	AV	35.4	27.5	5.9	32.0	1.1	37.9	53.9	16.0	*1)
Vert	4455.015	AV	38.6	30.7	7.0	31.4	1.1	46.0	53.9	7.9	
Vert	4924.000	AV	32.8	31.6	8.1	31.2	-	41.3	53.9	12.6	Floor noise
Vert	5940.032	AV	35.9	32.6	8.4	31.5	1.1	46.5	53.9	7.4	
Vert	7386.000	AV	33.9	36.3	9.1	32.5	-	46.8	53.9	7.1	Floor noise
Vert	9848.000	AV	31.2	38.4	10.5	32.7	-	47.4	53.9	6.5	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 (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

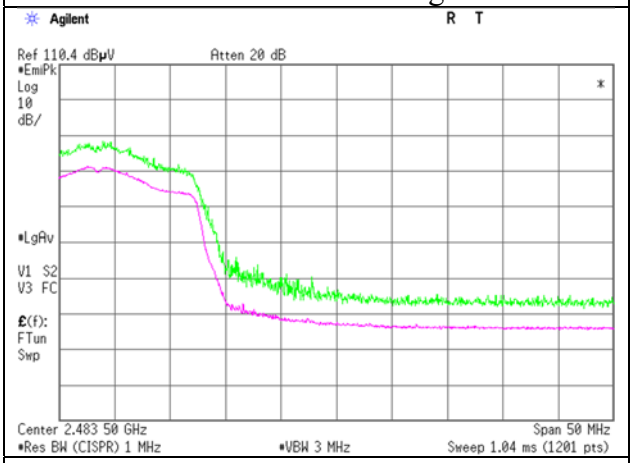
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	21 deg. C / 68 % RH
Engineer	Akihiko Maeda
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

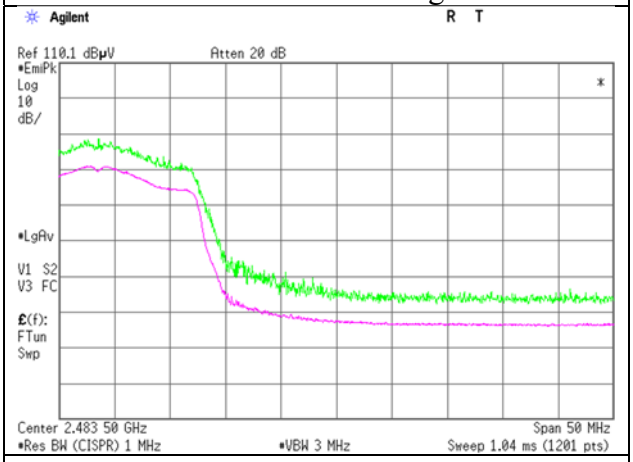
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	12475916H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	October 13, 2018	October 14, 2018	October 17, 2018
Temperature / Humidity	22 deg. C / 40 % RH	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Akihiko Maeda	Takumi Shimada
	(Below 1 GHz)	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-40 2422 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	148.501	QP	39.5	15.0	8.7	32.2	-	31.0	43.5	12.5	
Hori	297.004	QP	40.2	13.5	9.9	32.1	-	31.5	46.0	14.5	
Hori	445.500	QP	38.1	16.7	10.9	32.1	-	33.6	46.0	12.4	
Hori	594.005	QP	38.7	19.1	11.8	32.1	-	37.5	46.0	8.5	
Hori	742.500	QP	43.7	20.2	12.5	31.9	-	44.5	46.0	1.5	
Hori	891.004	QP	32.0	22.1	13.2	31.1	-	36.2	46.0	9.8	
Hori	1930.513	PK	49.3	26.2	5.5	32.4	-	48.6	73.9	25.3	
Hori	2227.496	PK	46.1	27.8	5.7	32.2	-	47.4	73.9	26.5	
Hori	2385.450	PK	59.2	27.6	5.9	32.1	-	60.6	73.9	13.3	
Hori	2390.000	PK	58.1	27.6	5.9	32.1	-	59.5	73.9	14.4	
Hori	4455.015	PK	46.0	30.7	7.0	31.4	-	52.3	73.9	21.6	
Hori	4844.000	PK	40.4	31.5	8.1	31.3	-	48.7	73.9	25.2	Floor noise
Hori	5940.032	PK	46.3	32.6	8.4	31.5	-	55.8	73.9	18.1	
Hori	7266.000	PK	41.8	36.2	9.1	32.4	-	54.7	73.9	19.2	Floor noise
Hori	9688.000	PK	42.3	38.1	10.4	32.7	-	58.1	73.9	15.8	Floor noise
Hori	1930.513	AV	43.1	26.2	5.5	32.4	-	42.4	53.9	11.5	
Hori	2227.496	AV	37.1	27.8	5.7	32.2	-	38.4	53.9	15.5	
Hori	2385.450	AV	48.3	27.6	5.9	32.1	1.5	51.2	53.9	2.7	
Hori	2390.000	AV	47.5	27.6	5.9	32.1	1.5	50.4	53.9	3.5	*1)
Hori	4455.015	AV	39.6	30.7	7.0	31.4	1.5	47.4	53.9	6.5	
Hori	4844.000	AV	32.0	31.5	8.1	31.3	-	40.3	53.9	13.6	Floor noise
Hori	5940.032	AV	39.0	32.6	8.4	31.5	1.5	50.0	53.9	3.9	
Hori	7266.000	AV	33.8	36.2	9.1	32.4	-	46.7	53.9	7.2	Floor noise
Hori	9688.000	AV	31.8	38.1	10.4	32.7	-	47.6	53.9	6.3	Floor noise
Vert	148.501	QP	40.8	15.0	8.7	32.2	-	32.3	43.5	11.2	
Vert	297.004	QP	40.4	13.5	9.9	32.1	-	31.7	46.0	14.3	
Vert	445.500	QP	38.0	16.7	10.9	32.1	-	33.5	46.0	12.5	
Vert	594.005	QP	39.3	19.1	11.8	32.1	-	38.1	46.0	7.9	
Vert	742.500	QP	42.8	20.2	12.5	31.9	-	43.6	46.0	2.4	
Vert	891.004	QP	34.7	22.1	13.2	31.1	-	38.9	46.0	7.1	
Vert	1930.513	PK	50.1	26.2	5.5	32.4	-	49.4	73.9	24.5	
Vert	2227.496	PK	49.6	27.8	5.7	32.2	-	50.9	73.9	23.0	
Vert	2385.450	PK	61.3	27.6	5.9	32.1	-	62.7	73.9	11.2	
Vert	2390.000	PK	60.4	27.6	5.9	32.1	-	61.8	73.9	12.1	
Vert	4455.015	PK	45.9	30.7	7.0	31.4	-	52.2	73.9	21.7	
Vert	4844.000	PK	40.4	31.5	7.2	31.3	-	47.8	73.9	26.1	Floor noise
Vert	5940.032	PK	44.1	32.6	8.4	31.5	-	53.6	73.9	20.3	
Vert	7266.000	PK	43.3	36.2	9.1	32.4	-	56.2	73.9	17.7	Floor noise
Vert	9688.000	PK	43.1	38.1	10.4	32.7	-	58.9	73.9	15.0	Floor noise
Vert	1930.513	AV	42.3	26.2	5.5	32.4	-	41.6	53.9	12.3	
Vert	2227.496	AV	42.5	27.8	5.7	32.2	-	43.8	53.9	10.1	
Vert	2385.450	AV	50.6	27.6	5.9	32.1	1.5	53.5	53.9	0.4	
Vert	2390.000	AV	50.3	27.6	5.9	32.1	1.5	53.2	53.9	0.7	*1)
Vert	4455.015	AV	39.2	30.7	7.0	31.4	1.5	47.0	53.9	6.9	
Vert	4844.000	AV	32.1	31.5	8.1	31.3	-	40.4	53.9	13.5	Floor noise
Vert	5940.032	AV	35.9	32.6	8.4	31.5	1.5	46.9	53.9	7.0	
Vert	7266.000	AV	32.9	36.2	9.1	32.4	-	45.8	53.9	8.1	Floor noise
Vert	9688.000	AV	31.8	38.1	10.4	32.7	-	47.6	53.9	6.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

Report No.	12475916H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	October 13, 2018	October 14, 2018	October 17, 2018
Temperature / Humidity	22 deg. C / 40 % RH	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Akihiko Maeda	Takumi Shimada
	(Below 1 GHz)	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-40 2422 MHz		

20dBc Data Sheet

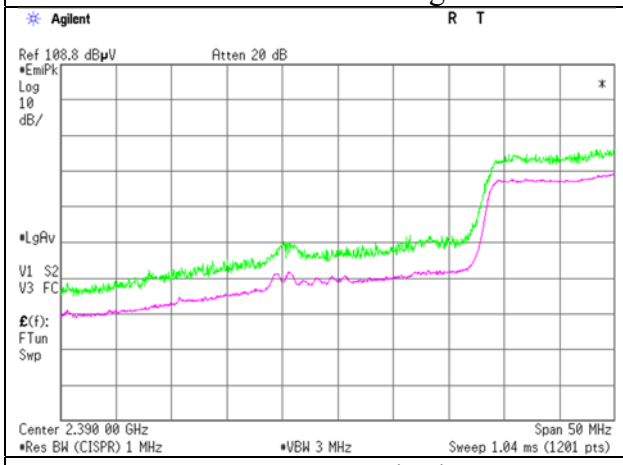
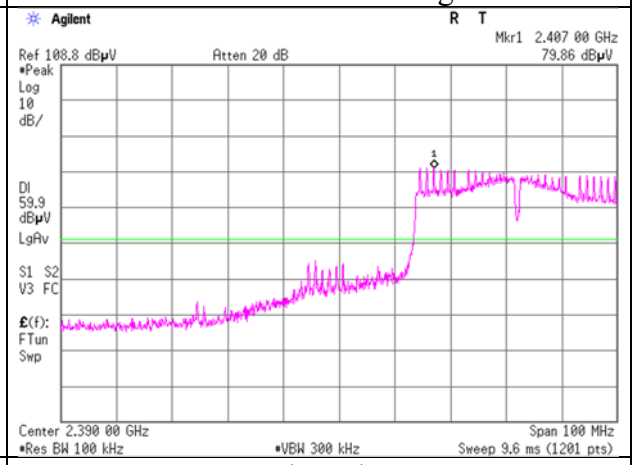
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2422.000	PK	79.9	27.5	5.9	32.1	81.2	-	-	Carrier
Hori	2400.000	PK	49.7	27.6	5.9	32.1	51.1	61.2	10.1	
Vert	2422.000	PK	81.8	27.5	5.9	32.1	83.1	-	-	Carrier
Vert	2400.000	PK	52.7	27.6	5.9	32.1	54.1	63.1	9.0	

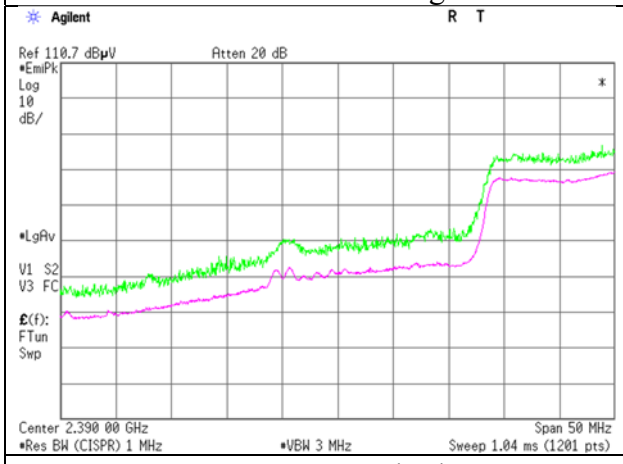
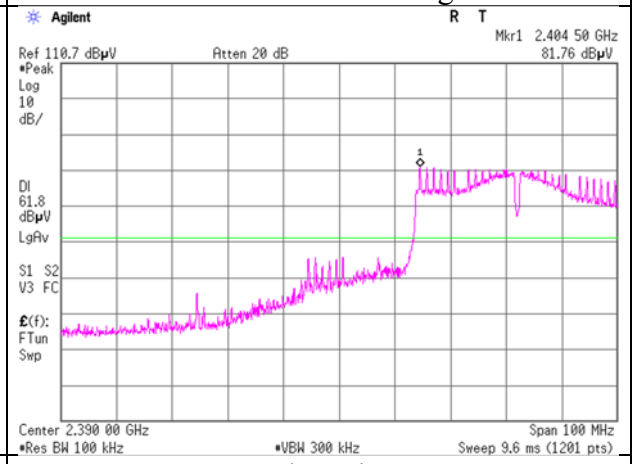
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 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.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	21 deg. C / 68 % RH
Engineer	Akihiko Maeda
	(1 GHz - 10 GHz)
Mode	Tx 11n-40 2422 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

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

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-40 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	1930.513	PK	50.1	26.2	5.5	32.4	-	49.4	73.9	24.5	
Hori	2227.496	PK	49.0	27.8	5.7	32.2	-	50.3	73.9	23.6	
Hori	4455.015	PK	44.9	30.7	7.0	31.4	-	51.2	73.9	22.7	
Hori	4874.000	PK	42.0	31.5	8.1	31.3	-	50.3	73.9	23.6	Floor noise
Hori	5940.032	PK	46.5	32.6	8.4	31.5	-	56.0	73.9	17.9	
Hori	7311.000	PK	42.6	36.3	9.1	32.4	-	55.6	73.9	18.3	Floor noise
Hori	9748.000	PK	41.7	38.3	10.4	32.7	-	57.7	73.9	16.2	Floor noise
Hori	1930.513	AV	42.9	26.2	5.5	32.4	-	42.2	53.9	11.7	
Hori	2227.496	AV	40.0	27.8	5.7	32.2	-	41.3	53.9	12.6	
Hori	4455.015	AV	36.4	30.7	7.0	31.4	1.5	44.2	53.9	9.7	
Hori	4874.000	AV	33.0	31.5	8.1	31.3	-	41.3	53.9	12.6	Floor noise
Hori	5940.032	AV	39.4	32.6	8.4	31.5	1.5	50.4	53.9	3.5	
Hori	7311.000	AV	33.6	36.3	9.1	32.4	-	46.6	53.9	7.3	Floor noise
Hori	9748.000	AV	31.9	38.3	10.4	32.7	-	47.9	53.9	6.0	Floor noise
Vert	1930.513	PK	49.0	26.2	5.5	32.4	-	48.3	73.9	25.6	
Vert	2227.496	PK	49.9	27.8	5.7	32.2	-	51.2	73.9	22.7	
Vert	4455.015	PK	45.4	30.7	7.0	31.4	-	51.7	73.9	22.2	
Vert	4874.000	PK	41.9	31.5	8.1	31.3	-	50.2	73.9	23.7	Floor noise
Vert	5940.032	PK	45.8	32.6	8.4	31.5	-	55.3	73.9	18.6	
Vert	7311.000	PK	41.9	36.3	9.1	32.4	-	54.9	73.9	19.0	Floor noise
Vert	9748.000	PK	41.3	38.3	10.4	32.7	-	57.3	73.9	16.6	Floor noise
Vert	1930.513	AV	39.8	26.2	5.5	32.4	-	39.1	53.9	14.8	
Vert	2227.496	AV	41.9	27.8	5.7	32.2	-	43.2	53.9	10.7	
Vert	4455.015	AV	37.4	30.7	7.0	31.4	1.5	45.2	53.9	8.7	
Vert	4874.000	AV	32.1	31.5	8.1	31.3	-	40.4	53.9	13.5	Floor noise
Vert	5940.032	AV	36.9	32.6	8.4	31.5	1.5	47.9	53.9	6.0	
Vert	7311.000	AV	33.4	36.3	9.1	32.4	-	46.4	53.9	7.5	Floor noise
Vert	9748.000	AV	31.6	38.3	10.4	32.7	-	47.6	53.9	6.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 14, 2018	October 17, 2018
Temperature / Humidity	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-40 2452 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	1930.513	PK	50.8	26.2	5.5	32.4	-	50.1	73.9	23.8	
Hori	2227.496	PK	45.6	27.8	5.7	32.2	-	46.9	73.9	27.0	
Hori	2483.500	PK	52.6	27.5	5.9	32.0	-	54.0	73.9	19.9	
Hori	4455.015	PK	48.5	30.7	7.0	31.4	-	54.8	73.9	19.1	
Hori	4904.000	PK	40.8	31.6	8.1	31.2	-	49.3	73.9	24.6	Floor noise
Hori	5940.032	PK	46.0	32.6	8.4	31.5	-	55.5	73.9	18.4	
Hori	7356.000	PK	42.9	36.3	9.1	32.4	-	55.9	73.9	18.0	Floor noise
Hori	9808.000	PK	42.1	38.4	10.5	32.7	-	58.3	73.9	15.6	Floor noise
Hori	1930.513	AV	44.5	26.2	5.5	32.4	-	43.8	53.9	10.1	
Hori	2227.496	AV	36.9	27.8	5.7	32.2	-	38.2	53.9	15.7	
Hori	2483.500	AV	41.6	27.5	5.9	32.0	1.5	44.5	53.9	9.4	*1)
Hori	4455.015	AV	39.1	30.7	7.0	31.4	1.5	46.9	53.9	7.0	
Hori	4904.000	AV	32.4	31.6	8.1	31.2	-	40.9	53.9	13.0	Floor noise
Hori	5940.032	AV	36.2	32.6	8.4	31.5	1.5	47.2	53.9	6.7	
Hori	7356.000	AV	33.9	36.3	9.1	32.4	-	46.9	53.9	7.0	Floor noise
Hori	9808.000	AV	31.6	38.4	10.5	32.7	-	47.8	53.9	6.1	Floor noise
Vert	1930.513	PK	51.8	26.2	5.5	32.4	-	51.1	73.9	22.8	
Vert	2227.496	PK	51.7	27.8	5.7	32.2	-	53.0	73.9	20.9	
Vert	2483.500	PK	52.5	27.5	5.9	32.0	-	53.9	73.9	20.0	
Vert	4455.015	PK	45.5	30.7	7.0	31.4	-	51.8	73.9	22.1	
Vert	4904.000	PK	41.2	31.6	8.1	31.2	-	49.7	73.9	24.2	Floor noise
Vert	5940.032	PK	44.7	32.6	8.4	31.5	-	54.2	73.9	19.7	
Vert	7356.000	PK	42.6	36.3	9.1	32.4	-	55.6	73.9	18.3	Floor noise
Vert	9808.000	PK	43.4	38.4	10.5	32.7	-	59.6	73.9	14.3	Floor noise
Vert	1930.513	AV	46.0	26.2	5.5	32.4	-	45.3	53.9	8.6	
Vert	2227.496	AV	44.5	27.8	5.7	32.2	-	45.8	53.9	8.1	
Vert	2483.500	AV	40.2	27.5	5.9	32.0	1.5	43.1	53.9	10.8	*1)
Vert	4455.015	AV	38.7	30.7	7.0	31.4	1.5	46.5	53.9	7.4	
Vert	4904.000	AV	32.8	31.6	8.1	31.2	-	41.3	53.9	12.6	Floor noise
Vert	5940.032	AV	36.0	32.6	8.4	31.5	1.5	47.0	53.9	6.9	
Vert	7356.000	AV	33.5	36.3	9.1	32.4	-	46.5	53.9	7.4	Floor noise
Vert	9808.000	AV	31.4	38.4	10.5	32.7	-	47.6	53.9	6.3	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

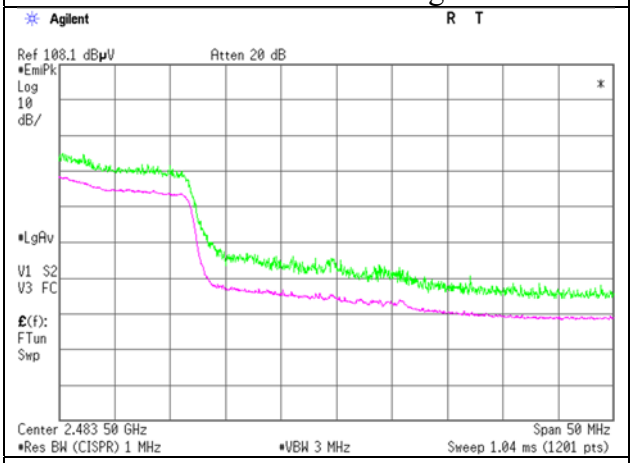
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	October 14, 2018
Temperature / Humidity	21 deg. C / 68 % RH
Engineer	Akihiko Maeda
	(1 GHz - 10 GHz)
Mode	Tx 11n-40 2452 MHz

Horizontal

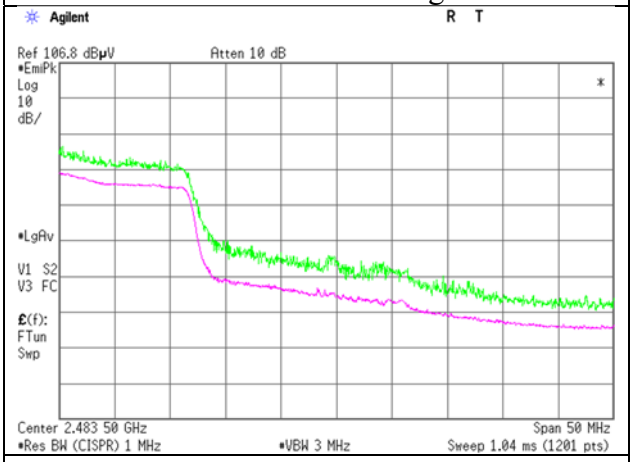
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	
Date	March 15, 2019	March 16, 2019
Temperature / Humidity	23 deg. C / 34 % RH	22 deg. C / 38 % RH
Engineer	Hiroyuki Furutaka	Hiroyuki Furutaka
	(1 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx BT LE 2402 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.	37.286	QP	25.4	16.0	7.3	32.2	-	16.5	40.0	23.5	
Hori.	148.360	QP	34.0	15.0	8.8	32.1	-	25.6	43.5	17.9	
Hori.	296.036	QP	40.9	13.6	10.1	31.9	-	32.6	46.0	13.4	
Hori.	370.884	QP	49.2	15.1	10.6	31.9	-	43.0	46.0	3.0	
Hori.	446.800	QP	24.4	16.8	11.1	32.0	-	20.3	46.0	25.7	
Hori.	476.860	QP	33.8	17.2	11.3	32.0	-	30.3	46.0	15.7	
Hori.	2390.000	PK	42.3	27.8	5.5	32.8	-	42.9	73.9	31.0	
Hori.	4804.000	PK	40.7	31.7	7.7	31.8	-	48.2	73.9	25.7	Floor noise
Hori.	7206.000	PK	43.3	35.7	8.9	32.7	-	55.2	73.9	18.7	Floor noise
Hori.	9608.000	PK	43.4	38.6	9.4	33.3	-	58.2	73.9	15.8	Floor noise
Hori.	2390.000	AV	33.5	27.8	5.5	32.8	1.9	36.0	53.9	17.9	*1)
Hori.	4804.000	AV	38.8	31.7	7.7	31.8	-	46.3	53.9	7.6	Floor noise
Hori.	7206.000	AV	34.4	35.7	8.9	32.7	-	46.3	53.9	7.6	Floor noise
Hori.	9608.000	AV	33.0	38.6	9.4	33.3	-	47.8	53.9	6.2	Floor noise
Vert.	37.280	QP	40.1	16.0	7.3	32.2	-	31.2	40.0	8.8	
Vert.	148.364	QP	38.2	15.0	8.8	32.1	-	29.8	43.5	13.7	
Vert.	296.036	QP	36.1	13.6	10.1	31.9	-	27.8	46.0	18.2	
Vert.	370.884	QP	38.5	15.1	10.6	31.9	-	32.3	46.0	13.7	
Vert.	446.800	QP	28.6	16.8	11.1	32.0	-	24.5	46.0	21.5	
Vert.	476.860	QP	29.3	17.2	11.3	32.0	-	25.8	46.0	20.2	
Vert.	2390.000	PK	42.5	27.8	5.5	32.8	-	43.1	73.9	30.8	
Vert.	4802.000	PK	41.0	31.7	7.7	31.8	-	48.5	73.9	25.4	Floor noise
Vert.	7206.000	PK	42.7	35.7	8.9	32.7	-	54.6	73.9	19.3	Floor noise
Vert.	9608.000	PK	43.4	38.6	9.4	33.3	-	58.2	73.9	15.8	Floor noise
Vert.	2390.000	AV	33.5	27.8	5.5	32.8	1.9	36.0	53.9	17.9	*1)
Vert.	4802.000	AV	32.5	31.7	7.7	31.8	-	40.0	53.9	13.9	Floor noise
Vert.	7206.000	AV	34.4	35.7	8.9	32.7	-	46.3	53.9	7.6	Floor noise
Vert.	9608.000	AV	33.1	38.6	9.4	33.3	-	47.9	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

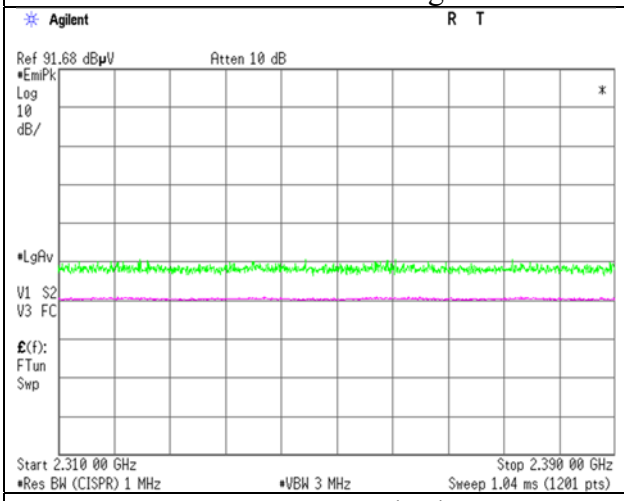
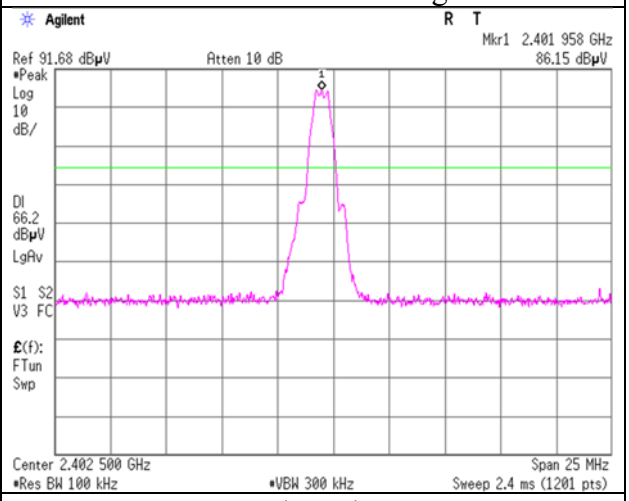
20dBc Data Sheet

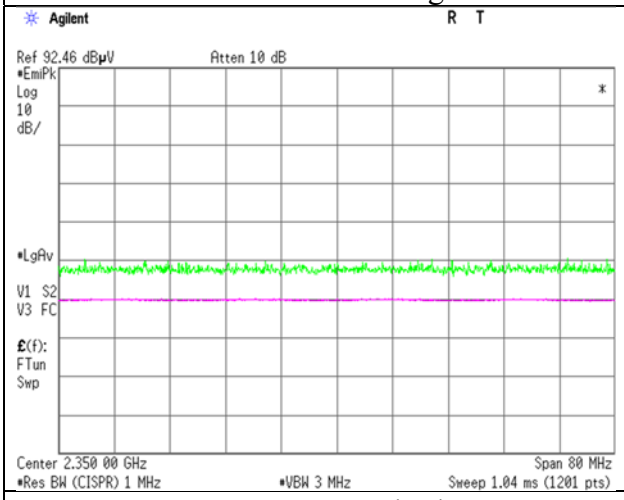
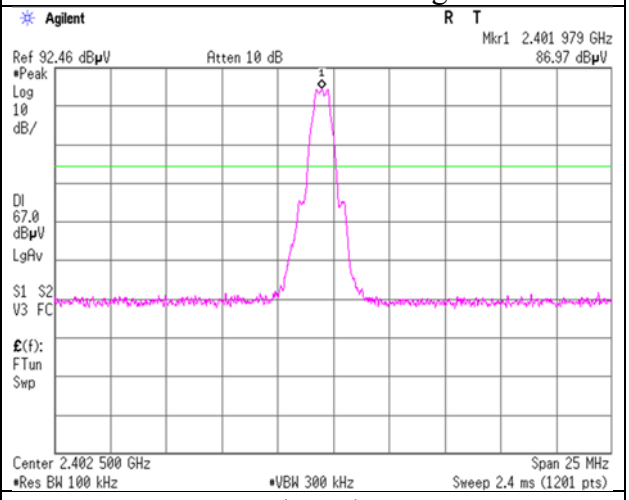
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	86.2	27.8	5.6	32.7	86.8	-	-	Carrier
Hori.	2400.000	PK	36.0	27.8	5.6	32.7	36.6	66.8	30.2	
Vert.	2402.000	PK	87.0	27.8	5.6	32.7	87.6	-	-	Carrier
Vert.	2400.000	PK	34.5	27.8	5.6	32.7	35.1	67.6	32.5	

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.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 15, 2019
Temperature / Humidity	23 deg. C / 34 % RH
Engineer	Hiroyuki Furutaka
	(1 GHz - 26.5 GHz)
Mode	Tx BT LE 2402 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

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

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	
Date	March 15, 2019	March 16, 2019
Temperature / Humidity	23 deg. C / 34 % RH	22 deg. C / 38 % RH
Engineer	Hiroyuki Furutaka	Hiroyuki Furutaka
	(1 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx BT LE 2440 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.	148.340	QP	32.0	15.0	8.8	32.1	-	23.6	43.5	19.9	
Hori.	202.526	QP	38.8	11.5	9.3	32.0	-	27.5	43.5	16.0	
Hori.	296.722	QP	43.0	13.6	10.1	31.9	-	34.7	46.0	11.3	
Hori.	370.880	QP	48.5	15.1	10.6	31.9	-	42.3	46.0	3.7	
Hori.	445.060	QP	43.2	16.7	11.1	32.0	-	39.1	46.0	6.9	
Hori.	599.984	QP	29.5	19.3	12.1	32.0	-	28.9	46.0	17.1	
Hori.	4880.000	PK	42.4	31.7	7.7	31.8	-	50.0	73.9	23.9	Floor noise
Hori.	7320.000	PK	41.3	36.3	8.9	32.7	-	53.8	73.9	20.1	Floor noise
Hori.	9760.000	PK	41.8	39.1	9.4	33.4	-	56.9	73.9	17.0	Floor noise
Hori.	4880.000	AV	33.0	31.7	7.7	31.8	-	40.6	53.9	13.3	Floor noise
Hori.	7320.000	AV	34.0	36.3	8.9	32.7	-	46.5	53.9	7.4	Floor noise
Hori.	9760.000	AV	32.3	39.1	9.4	33.4	-	47.4	53.9	6.5	Floor noise
Vert.	30.993	QP	36.4	18.2	7.2	32.2	-	29.6	40.0	10.4	
Vert.	37.428	QP	39.2	15.9	7.3	32.2	-	30.2	40.0	9.8	
Vert.	70.670	QP	44.8	6.3	7.8	32.2	-	26.8	40.0	13.2	
Vert.	148.340	QP	36.8	15.0	8.8	32.1	-	28.4	43.5	15.1	
Vert.	296.722	QP	39.8	13.6	10.1	31.9	-	31.5	46.0	14.5	
Vert.	445.050	QP	37.0	16.7	11.1	32.0	-	32.9	46.0	13.1	
Vert.	4880.000	PK	41.5	31.7	7.7	31.8	-	49.1	73.9	24.8	Floor noise
Vert.	7320.000	PK	41.8	36.3	8.9	32.7	-	54.3	73.9	19.6	Floor noise
Vert.	9760.000	PK	42.6	39.1	9.4	33.4	-	57.7	73.9	16.2	Floor noise
Vert.	4880.000	AV	32.5	31.7	7.7	31.8	-	40.1	53.9	13.8	Floor noise
Vert.	7320.000	AV	33.7	36.3	8.9	32.7	-	46.2	53.9	7.7	Floor noise
Vert.	9760.000	AV	32.4	39.1	9.4	33.4	-	47.5	53.9	6.4	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	
Date	March 15, 2019	March 16, 2019
Temperature / Humidity	23 deg. C / 34 % RH	22 deg. C / 38 % RH
Engineer	Hiroyuki Furutaka	Hiroyuki Furutaka
	(1 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx BT LE 2480 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.	162.799	QP	32.0	15.8	8.9	32.1	-	24.6	43.5	18.9	
Hori.	205.526	QP	38.7	11.4	9.3	32.0	-	27.3	43.5	16.2	
Hori.	296.072	QP	43.0	13.6	10.1	31.9	-	34.7	46.0	11.3	
Hori.	370.880	QP	48.4	15.1	10.6	31.9	-	42.2	46.0	3.8	
Hori.	445.060	QP	43.0	16.7	11.1	32.0	-	38.9	46.0	7.1	
Hori.	599.984	QP	29.4	19.3	12.1	32.0	-	28.8	46.0	17.2	
Hori.	2483.500	PK	41.6	27.5	5.6	32.7	-	42.0	73.9	31.9	
Hori.	4960.000	PK	40.7	31.8	7.7	31.8	-	48.4	73.9	25.5	Floor noise
Hori.	7440.000	PK	43.0	36.6	8.9	32.7	-	55.8	73.9	18.1	Floor noise
Hori.	9920.000	PK	42.0	39.1	9.4	33.4	-	57.1	73.9	16.9	Floor noise
Hori.	2483.500	AV	33.6	27.5	5.6	32.7	1.9	35.9	53.9	18.0	*1)
Hori.	4960.000	AV	33.0	31.8	7.7	31.8	-	40.7	53.9	13.2	Floor noise
Hori.	7440.000	AV	34.1	36.6	8.9	32.7	-	46.9	53.9	7.0	Floor noise
Hori.	9920.000	AV	32.8	39.1	9.4	33.4	-	47.9	53.9	6.1	Floor noise
Vert.	31.766	QP	38.1	18.0	7.2	32.2	-	31.0	40.0	9.0	
Vert.	37.380	QP	38.6	15.9	7.3	32.2	-	29.6	40.0	10.4	
Vert.	70.670	QP	45.0	6.3	7.8	32.2	-	27.0	40.0	13.0	
Vert.	148.356	QP	37.0	15.0	8.8	32.1	-	28.6	43.5	14.9	
Vert.	296.723	QP	40.0	13.6	10.1	31.9	-	31.7	46.0	14.3	
Vert.	445.000	QP	37.1	16.7	11.1	32.0	-	33.0	46.0	13.0	
Vert.	2483.500	PK	41.4	27.5	5.6	32.7	-	41.8	73.9	32.1	
Vert.	4960.000	PK	41.0	31.8	7.7	31.8	-	48.7	73.9	25.2	Floor noise
Vert.	7440.000	PK	41.7	36.6	8.9	32.7	-	54.5	73.9	19.4	Floor noise
Vert.	9920.000	PK	43.1	39.1	9.4	33.4	-	58.2	73.9	15.8	Floor noise
Vert.	2483.500	AV	33.6	27.5	5.6	32.7	1.9	35.9	53.9	18.0	*1)
Vert.	4960.000	AV	32.7	31.8	7.7	31.8	-	40.4	53.9	13.5	Floor noise
Vert.	7440.000	AV	34.0	36.6	8.9	32.7	-	46.8	53.9	7.1	Floor noise
Vert.	9920.000	AV	32.8	39.1	9.4	33.4	-	47.9	53.9	6.1	Floor noise

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

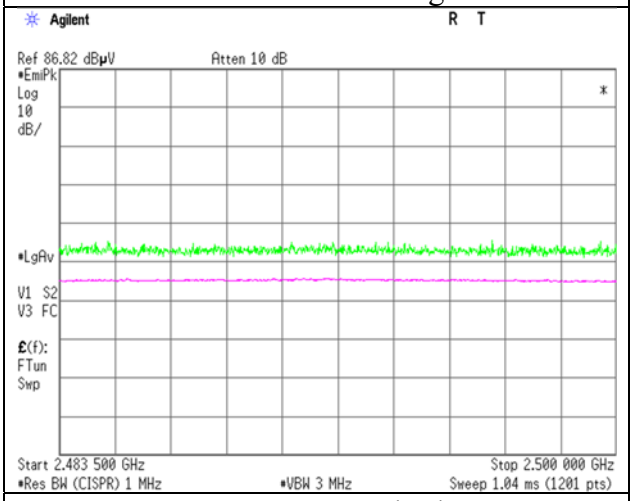
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

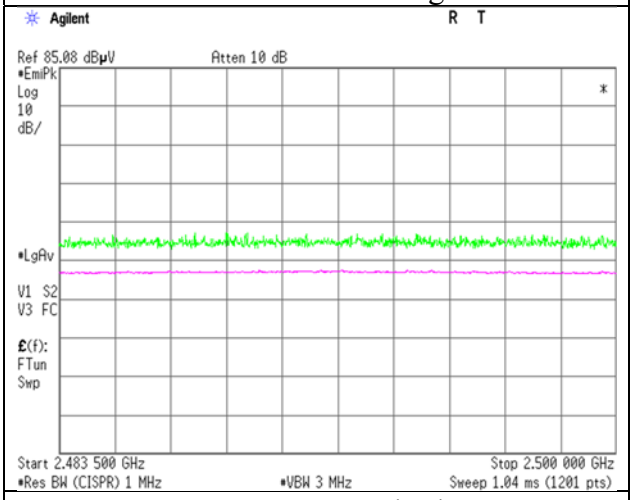
Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 15, 2019
Temperature / Humidity	23 deg. C / 34 % RH
Engineer	Hiroyuki Furutaka
	(1 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz

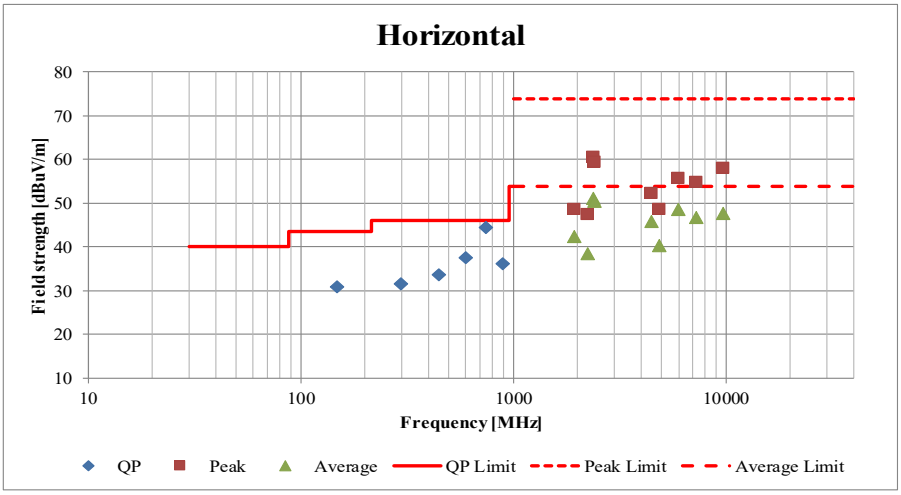
Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

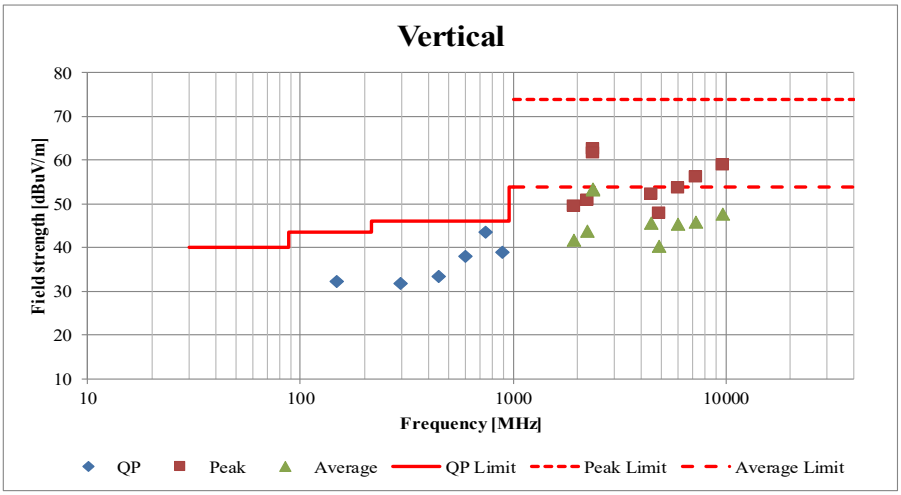
Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12475916H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	October 13, 2018	October 14, 2018	October 17, 2018
Temperature / Humidity	22 deg. C / 40 % RH	21 deg. C / 68 % RH	22 deg. C / 53 % RH
Engineer	Akihiko Maeda (Below 1 GHz)	Akihiko Maeda (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 26.5 GHz)
Mode	Tx 11n-40 2422 MHz		

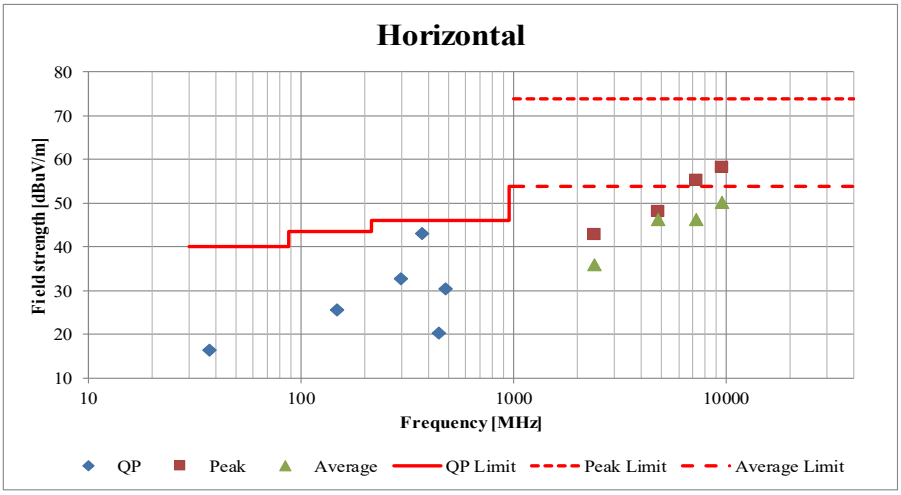


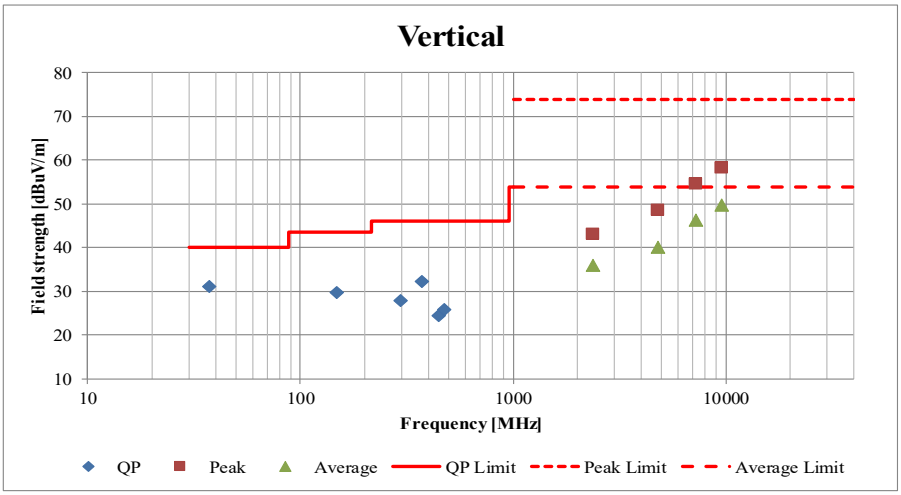


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12475916H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	
Date	March 15, 2019	March 16, 2019
Temperature / Humidity	23 deg. C / 34 % RH	22 deg. C / 38 % RH
Engineer	Hiroyuki Furutaka (1 GHz - 26.5 GHz)	Hiroyuki Furutaka (Below 1 GHz)
Mode	Tx BT LE 2402 MHz	



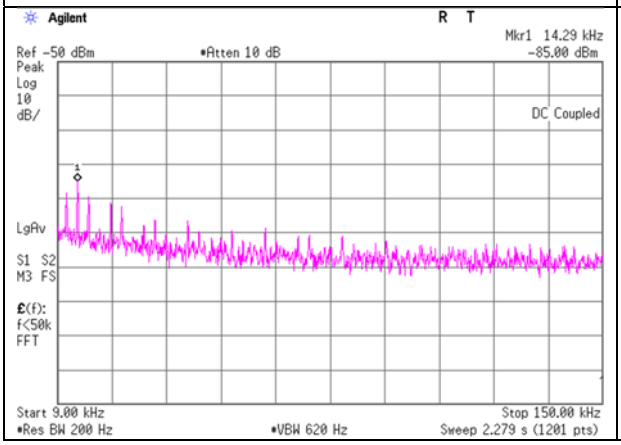


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

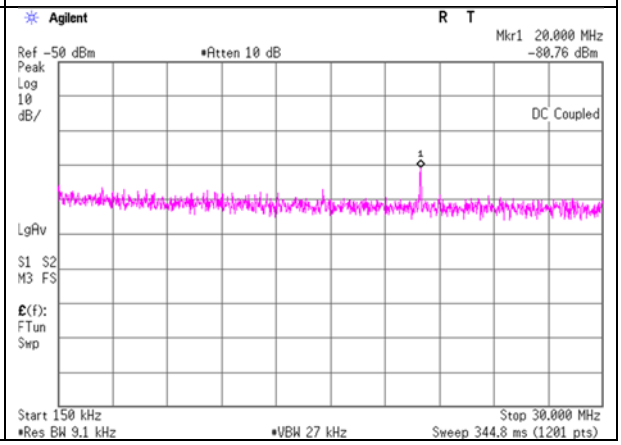
Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.8 Measurement Room
Date	October 23, 2018
Temperature / Humidity	24 deg. C / 51 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-40 2422 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
14.29	-85.0	0.40	9.8	2.0	1	-72.8	300	6.0	-11.5	44.5	56.0	
20000.00	-80.8	0.49	9.8	2.0	1	-68.4	30	6.0	12.8	29.5	16.7	

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

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

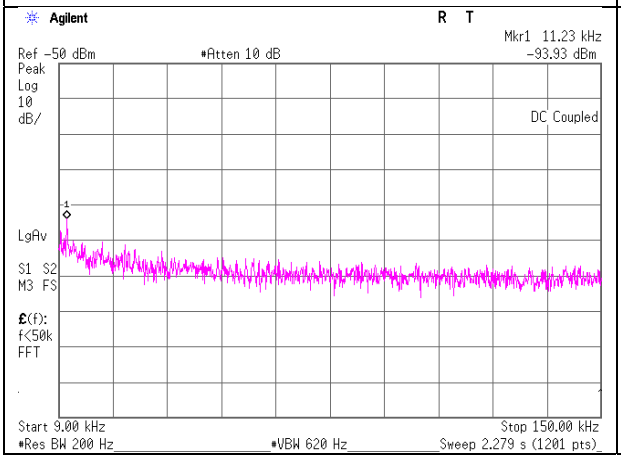
N: Number of output

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

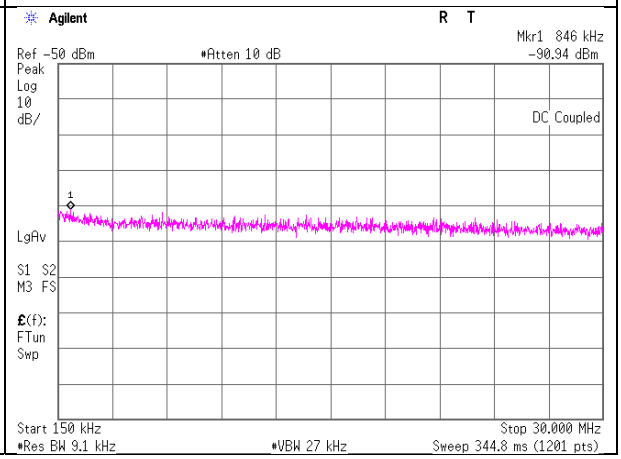
Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-93.9	0.40	9.8	2.0	1	-81.7	300	6.0	-20.4	46.5	66.9	
846.00	-90.9	0.40	9.8	2.0	1	-78.7	30	6.0	2.5	29.0	26.5	

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

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

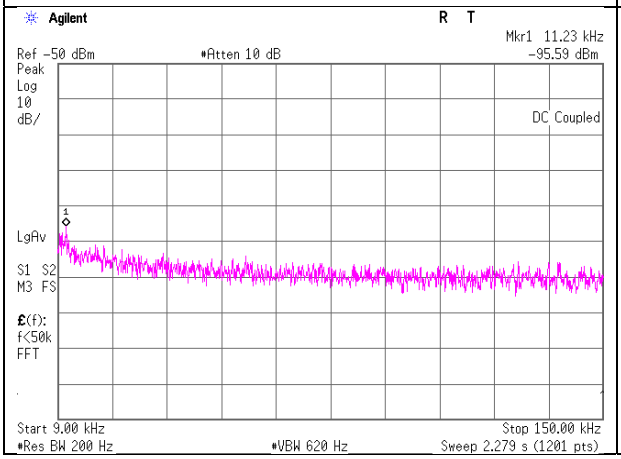
N: Number of output

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

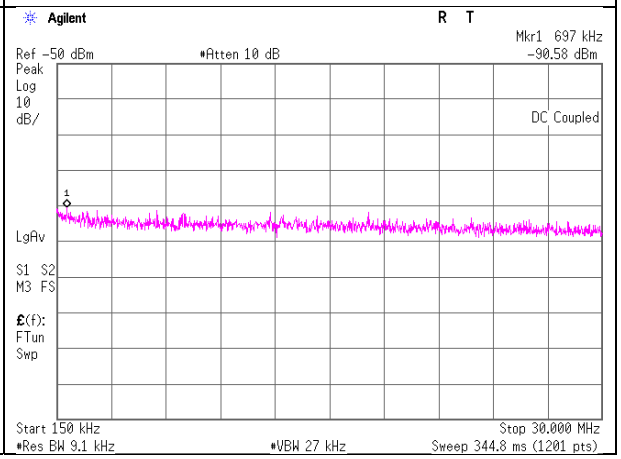
Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-95.6	0.40	9.8	2.0	1	-83.4	300	6.0	-22.1	46.5	68.6	
697.00	-90.6	0.40	9.8	2.0	1	-78.4	30	6.0	2.9	30.7	27.8	

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

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

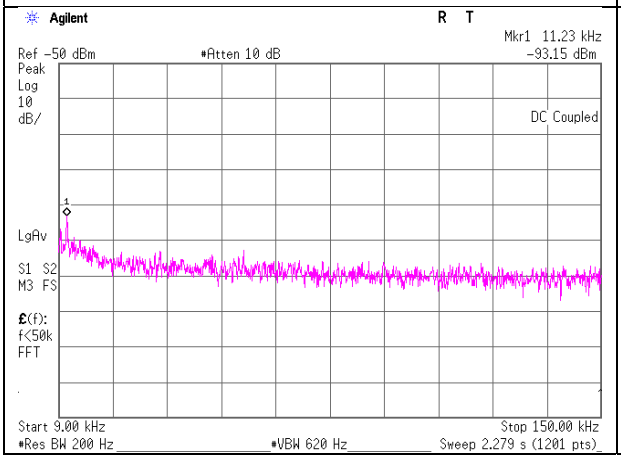
N: Number of output

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

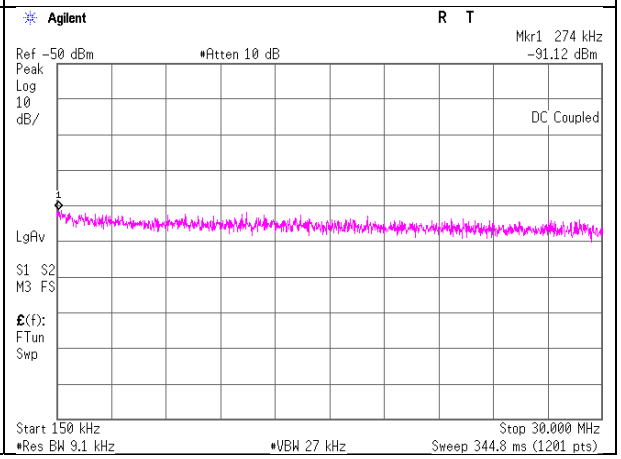
Conducted Spurious Emission

Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-93.2	0.40	9.8	2.0	1	-80.9	300	6.0	-19.7	46.5	66.2	
274.00	-91.1	0.40	9.8	2.0	1	-78.9	300	6.0	-17.7	18.8	36.5	

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

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

N: Number of output

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

Power Density

Report No.	12475916H		
Test place	Ise EMC Lab.		
	No.4 Measurement Room	No.8 Measurement Room	No.7 Shielded Room
Date	January 18, 2019	October 25, 2018	January 27, 2019
Temperature / Humidity	23 deg. C / 38 % RH	26 deg. C / 34 % RH	23 deg. C / 30 % RH
Engineer	Junki Nagatomi	Takafumi Noguchi	Tomoki Matsui
Mode	Tx		

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-17.03	0.40	10.06	-6.57	8.00	14.57
2437	-15.88	0.40	10.06	-5.42	8.00	13.42
2462	-16.40	0.40	10.06	-5.94	8.00	13.94

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-20.63	1.31	10.06	-9.26	8.00	17.26
2437	-20.48	1.32	10.06	-9.10	8.00	17.10
2462	-20.57	1.32	10.06	-9.19	8.00	17.19

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-18.50	1.31	10.06	-7.13	8.00	15.13
2437	-19.34	1.32	10.06	-7.96	8.00	15.96
2462	-18.50	1.32	10.06	-7.12	8.00	15.12

11n-40

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2422	-21.64	1.31	10.06	-10.27	8.00	18.27
2437	-22.07	1.32	10.06	-10.69	8.00	18.69
2452	-22.10	1.32	10.06	-10.72	8.00	18.72

Power Density

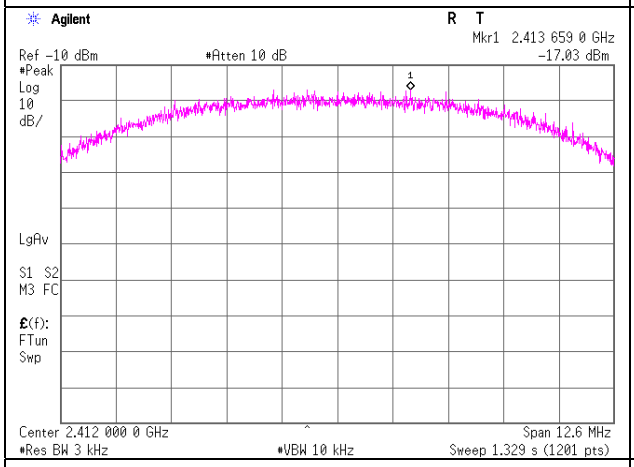
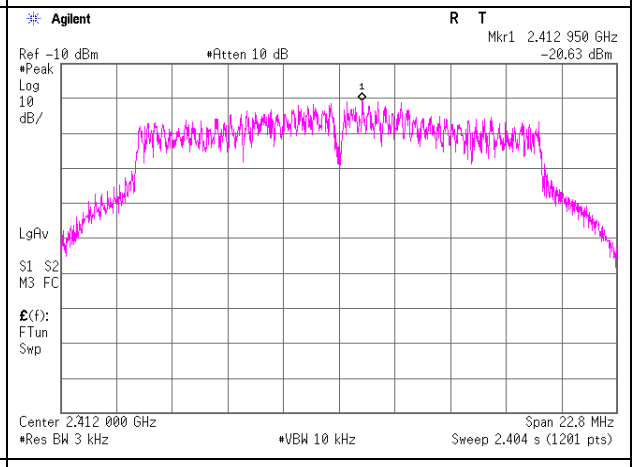
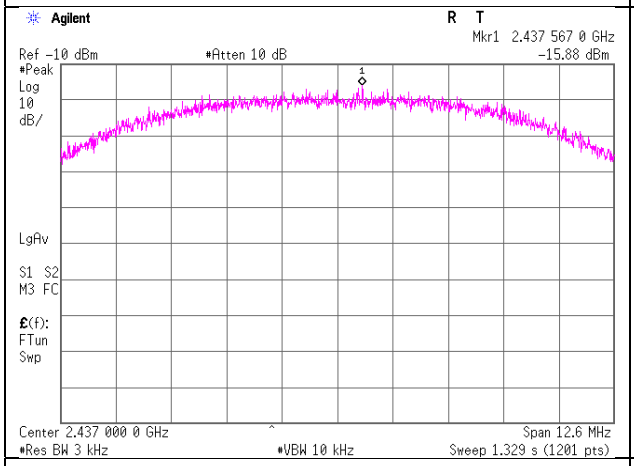
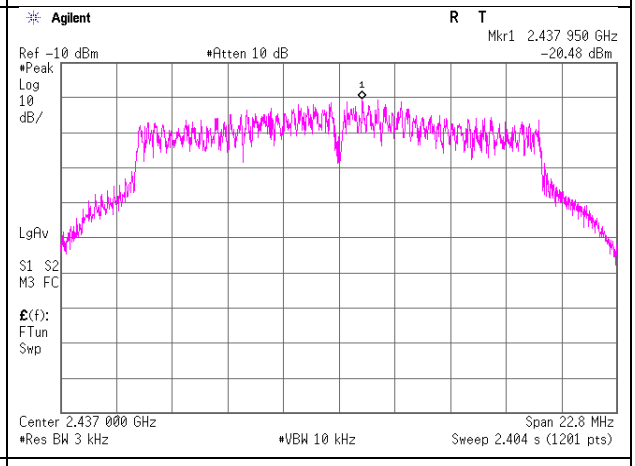
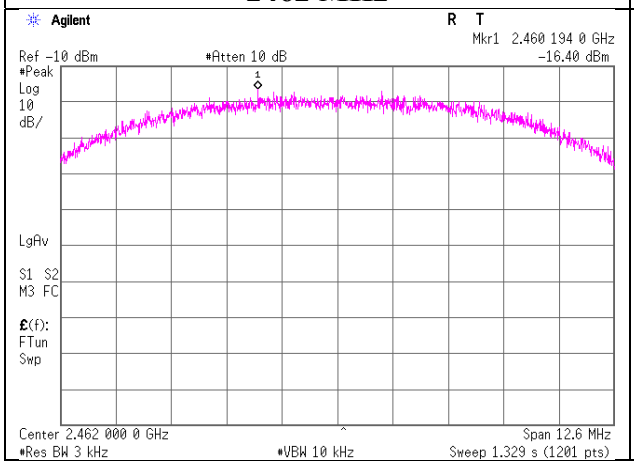
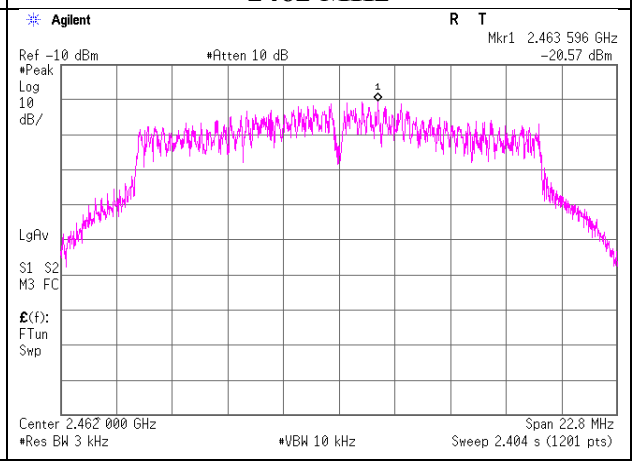
Report No.	12475916H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 14, 2019
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-18.41	0.40	10.10	-7.91	8.00	15.91
2440	-18.42	0.40	10.10	-7.92	8.00	15.92
2480	-19.05	0.40	10.10	-8.55	8.00	16.55

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

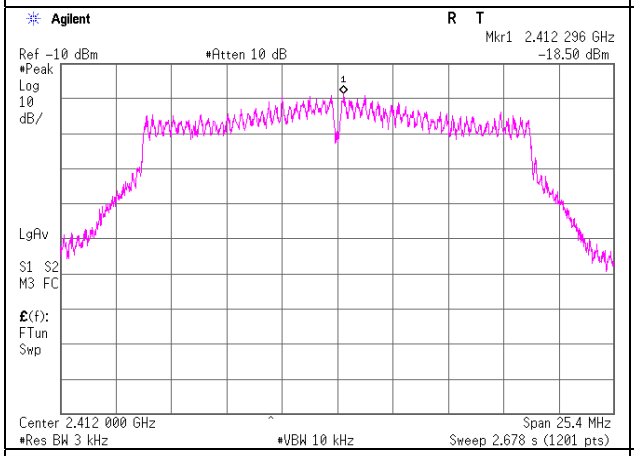
Power Density

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

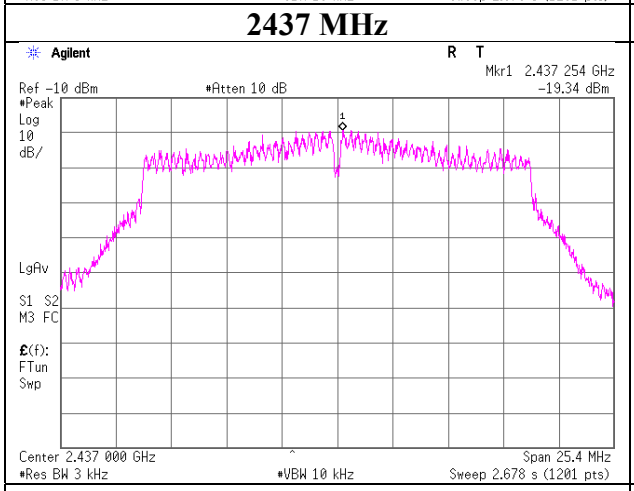
Power Density

11n-20

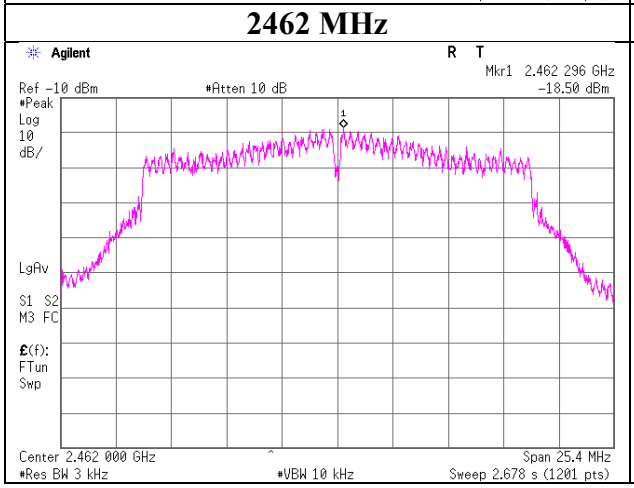
2412 MHz



2437 MHz

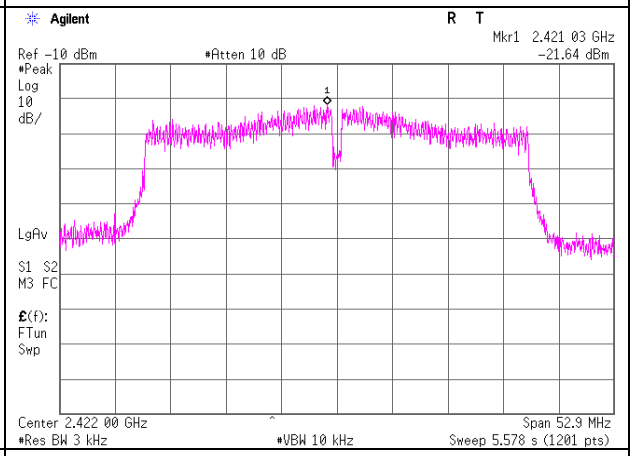


2462 MHz

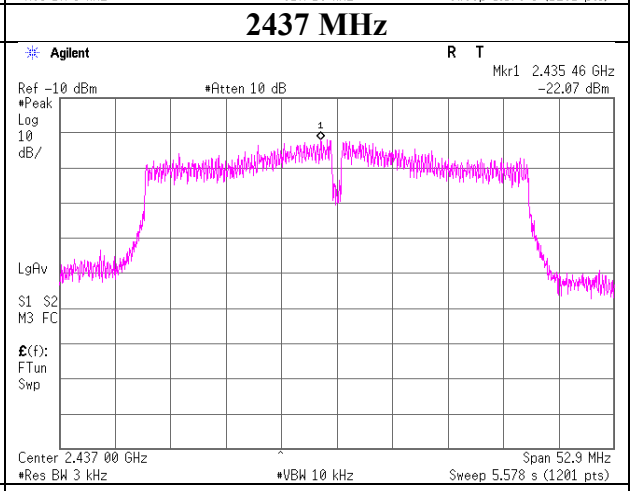


11n-40

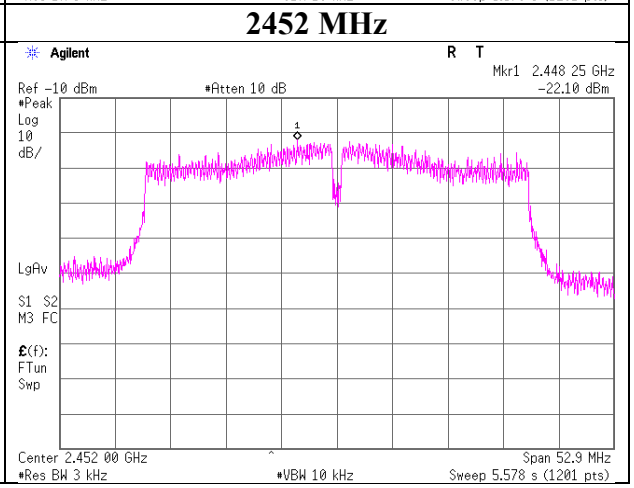
2422 MHz



2437 MHz



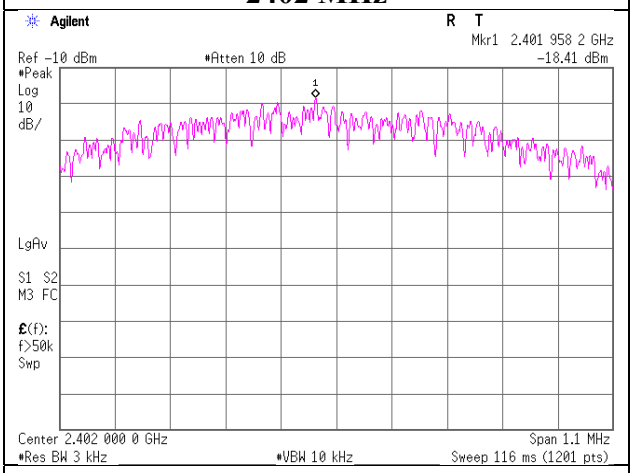
2452 MHz



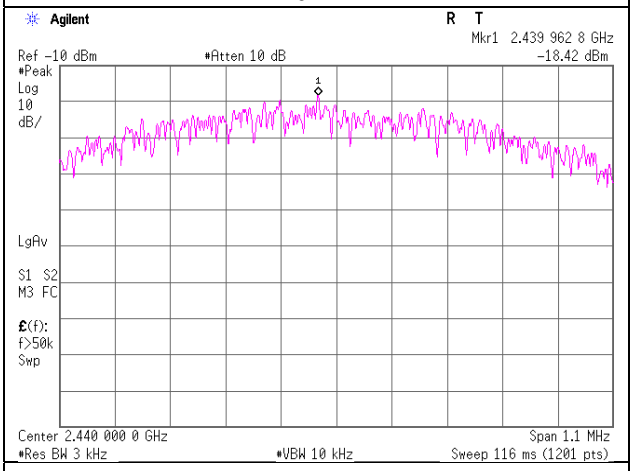
Power Density

BT LE

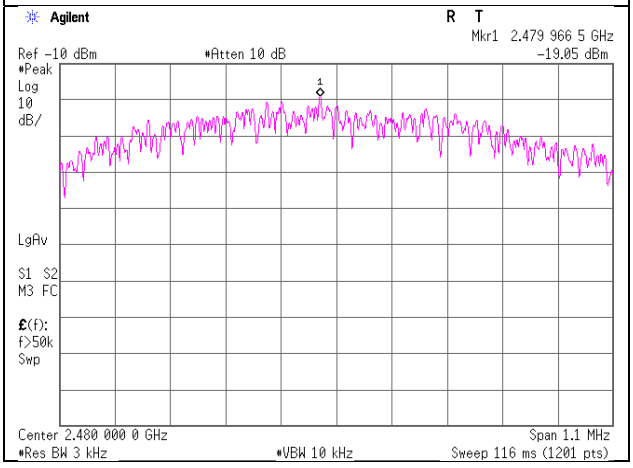
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test Instruments 1/2

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	142182	Measure	KOMELON	KMC-36	-	-	-	-
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	06/29/2018	06/30/2020	24
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/05/2018	12/31/2019	12
RE/AT/RE	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/07/2018	11/30/2019	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/21/2018	08/31/2019	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	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/19/2018	09/30/2019	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	06/06/2018	06/30/2019	12
RE/AT	141899	Spectrum Analyzer	AGILENT	E4448A	MY46180655	08/10/2018	08/31/2019	12
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
RE/AT	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/29/2019	01/31/2020	12
RE/AT	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
AT	141226	Microwave Cable	Junkosha	MMX221-00500DM SDMS	1502S304	03/05/2019	03/31/2020	12
RE	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	06/01/2018	06/30/2019	12
AT	141269	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	03/12/2018	03/31/2019	12
AT	141812	Power Meter	AGILENT	8990B	MY51000271	08/21/2018	08/31/2019	12
AT	141835	Power sensor	AGILENT	N1923A	MY54070004	08/21/2018	08/31/2019	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	01/30/2018	01/31/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	06/01/2018	06/30/2019	12
RE	141397	Coaxial Cable	UL Japan	-	-	06/13/2018	06/30/2019	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/03/2018	10/31/2019	12
RE/AT	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	01/11/2019	01/31/2020	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	06/08/2018	06/30/2019	12
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/04/2018	10/31/2019	12
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	06/14/2018	06/30/2019	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	06/08/2018	06/30/2019	12
RE/AT	141900	Spectrum Analyzer	AGILENT	E4440A	MY46185823	11/15/2018	01/30/2019	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	06/30/2020	24
RE/CE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	01/11/2019	01/31/2020	12
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/06/2018	08/31/2019	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	06/04/2018	06/30/2019	12
RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
RE	141323	Coaxial cable	UL Japan	-	-	07/03/2018	07/31/2019	12
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/20/2018	02/31/2019	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/08/2019	02/29/2020	12
RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	01/29/2019	01/31/2020	12
RE	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	06/04/2018	06/30/2019	12

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Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
AT	141395	Coaxial Cable	UL Japan	-	-	11/13/2018	01/30/2019	12
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/02/2018	01/30/2019	12
AT	141809	Power Meter	ANRITSU	ML2495A	825002	05/21/2018	05/31/2019	12
AT	141830	Power sensor	ANRITSU	MA2411B	738285	05/21/2018	05/31/2019	12
AT	141902	Spectrum Analyzer	AGILENT	E4440A	MY46187105	10/04/2018	10/31/2019	12
AT	141361	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	03/04/2019	03/31/2020	12
AT	141227	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S305	03/05/2019	03/31/2020	12
AT	141572	Thermo-Hygrometer	CUSTOM	CTH-201	3401	01/11/2019	01/31/2020	12
AT	141360	DIGITAL HiTESTER	HIOKI	3805	70900532	01/29/2019	01/31/2020	12
AT	141334	Attenuator(10dB)	Suhner	6810.19.A	-	12/06/2018	12/31/2019	12
AT	141810	Power Meter	ANRITSU	ML2495A	824014	10/09/2018	10/31/2019	12
AT	141832	Power sensor	ANRITSU	MA2411B	738174	10/09/2018	10/31/2019	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	06/07/2018	06/30/2019	12
RE	141513	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	06/07/2018	06/30/2019	12
RE	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/19/2018	09/30/2019	12
RE	141580	MicroWave System Amplifier	AGILENT	83017A	MY39500779	03/05/2019	03/31/2020	12
CE	141358	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	07/25/2018	07/31/2019	12
RE	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/ 1902S579(5m)	03/05/2019	03/31/2020	12
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/06/2018	04/30/2019	12
CE	141927	Terminator	TME	CT-01	-	10/26/2018	10/31/2019	12
CE	141247	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/06/2018	12/31/2019	12
CE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ sucoform141-PE/ 421-010	-/00640	07/03/2018	07/31/2019	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/24/2018	07/31/2019	12

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

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

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

Test item: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test