




RADIO TEST REPORT


Test Report No. : 12429781S-J-R2

Applicant : RICOH COMPANY, LTD.
Type of Equipment : Digital Camera
Model No. : R02020
*Wireless LAN/ Bluetooth Low Energy part
FCC ID : BBP-R02020
Test regulation : FCC Part 15 Subpart C: 2018
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. This report is a revised version of 12429781S-J-R1. 12429781S-J-R1 is replaced with this report.

Date of test: August 20 to September 19 2018

Representative test engineer: 
Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by: 
Toyokazu Imamura
Leader
Consumer Technology Division



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

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SECTION 1: Customer information

Company Name : RICOH COMPANY, LTD.
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Facsimile Number : +81-3-3775-8531
Contact Person : Kenji Daigo

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

2.1 Identification of E.U.T.

Type of Equipment : Digital Camera
Model No. : R02020
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5.0 V (USB), DC 3.6 V (Battery)
Receipt Date of Sample : August 20, 2018
Country of Mass-production : China
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: R02020 (referred to as the EUT in this report) is a Digital Camera.

General Specification

Clock frequency (ies)

Clock	Oscillation Source	Frequency
Wireless IC (Main Clock)	Crystal Unit	48 MHz
Wireless IC (Command Clock)	ASIC	30 MHz/60 MHz

Radio Specification

Equipment type	:	Transceiver
Frequency of operation	:	2.4 GHz: 2402 MHz -2480 MHz (Bluetooth BDR/EDR/Low Energy (LE)) 2412 MHz -2462 MHz (IEEE 802.11b, 11g, 11n (HT20)) W52: 5180 MHz -5240 MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5190 MHz -5230 MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5210 MHz (IEEE 802.11ac (VHT80))
Bandwidth	:	20 MHz (IEEE 802.11a/b/g/n/ac), 40 MHz (IEEE 802.11n/ac), 80 MHz(IEEE 802.11ac) , 1 MHz (Bluetooth BDR/EDR/Low Energy (LE))
Channel spacing	:	5 MHz (Wi-Fi 2.4 GHz), 20 MHz/40 MHz/80 MHz (Wi-Fi 5 GHz), 1 MHz (Bluetooth BDR/EDR), 2 MHz (Bluetooth LE)
Type of modulation	:	DSSS (IEEE 802.11b), OFDM (IEEE 802.11a/g/n/ac), FHSS (Bluetooth BDR/EDR/ Low Energy (LE))
Antenna type	:	Pattern antenna ($\lambda/2$ dipole antenna) + Parasitic element (Cu sheet)
Antenna connector type	:	MM5829-2700 <manufactured by Murata>
Antenna gain	:	[2.4 GHz] 3.52 dBi [5 GHz] 2.87 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods ----- IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	22.9 dB, 0.16200 MHz, QP L1 Tx 11g 2462 MHz	Complied	-
6 dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05 ----- IC: -	FCC: Section 15.247(a)(2) ----- IC: RSS-247 5.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05 ----- IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ----- IC: RSS-247 5.4(d)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05 ----- IC: -	FCC: Section 15.247(e) ----- IC: RSS-247 5.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05 ----- IC: RSS-Gen 6.13	FCC: Section 15.247(d) ----- IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.2 dB 9608.00 MHz, AV, Hori. BT LE 2402 MHz 5.2 dB 9760.00 MHz, AV, Hori. BT LE 2440 MHz	Complied#	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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 v05 8.5 and 8.6.

Symbols:

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

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

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

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to RF Module regardless of input voltage.
Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	Complied	Conducted

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

3.4 Uncertainty

EMI

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

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Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.5 dB	2.5 dB	2.5 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.9 dB	4.8 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.90 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.04 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

3.5 Test Location

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JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

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)

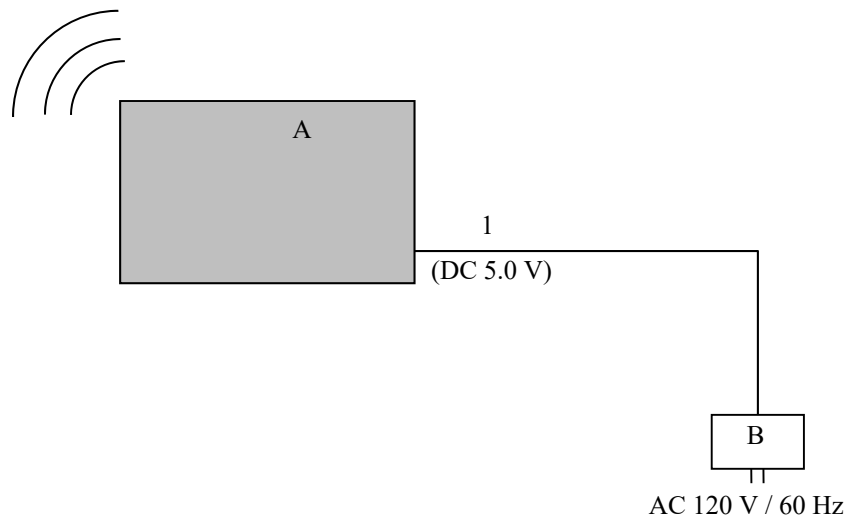
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009

Mode	Remarks*
Transmitting (Tx), IEEE 802.11b (11b)	11 Mbps, Short, PN9
Transmitting (Tx), IEEE 802.11g (11g)	48 Mbps, PN9
Transmitting (Tx), IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 7, PN9
Transmitting (Tx), Bluetooth (BT) Low Energy (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: 11 dBm Software: 07020018(0803) *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	Tx 11g *1)	2462 MHz
	Tx BT LE	2440 MHz
Spurious Emission	Tx 11b	2412 MHz
	Tx 11g	2437 MHz
	Tx 11n-20	2462 MHz
	Tx BT LE	2402 MHz 2440 MHz 2480 MHz
6 dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	Tx 11b	2412 MHz
	Tx 11g	2437 MHz
	Tx 11n-20	2462 MHz
	Tx BT LE	2402 MHz 2440 MHz 2480 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.		

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Digital Camera	R02020	YN10001081 *1) YN10001066 *2)	RICOH	EUT
B	AC Adapter	AC-U2	18011000084	RICOH	-

*1) Used for Radiated emission test.

*2) Used for Antenna terminal conducted tests.

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB	0.4	Shielded	Shielded	-

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SECTION 5: Conducted Emission

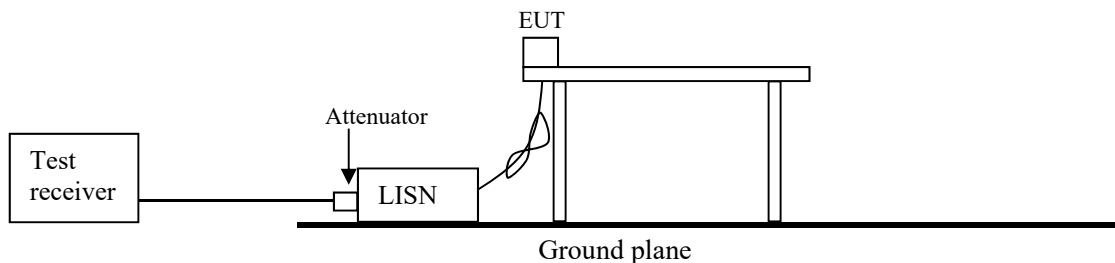
Test Procedure and conditions

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

The rear of tabletop was located 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.

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

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 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 via AC adapter in a Shielded room.

The EUT via AC adapter 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

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SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v05".

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

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

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

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.

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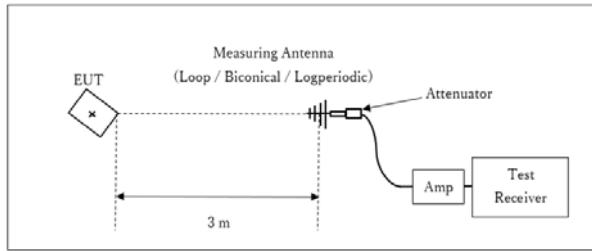
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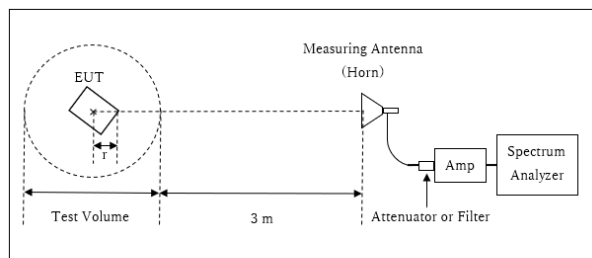
Below 1 GHz



× : Center of turn table

Test Distance : 3 m

1 GHz - 13 GHz



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

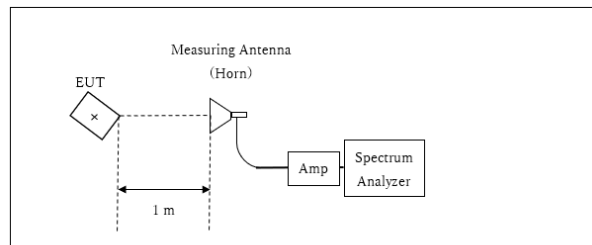
Distance Factor: $20 \times \log (3.93 \text{ m}^* / 3.0 \text{ m}) = 2.35 \text{ dB}$

*Test Distance : $(3 + \text{Test Volume} / 2) - r = 3.93 \text{ m}$

Test Volume : 2 m (Test Volume has been calibrated based on CISPR16-1-4.)

$r = 0.07 \text{ m}$

13 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: $20 \times \log (1.0 \text{ m}^* / 3.0 \text{ m}) = -9.54 \text{ dB}$

*Test Distance : 1 m

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- 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.

(Wireless LAN)

Worst position:

	Below 1 GHz	1 GHz - 2.8 GHz	2.8 GHz - 13 GHz	13 GHz - 18 GHz	18 GHz - 26.5 GHz
Horizontal	X	X	Y	X	X
Vertical	X	X	Y	X	X

(Bluetooth Low Energy)

Worst position:

	Below 1 GHz	1 GHz - 2.8 GHz	2.8 GHz - 13 GHz	13 GHz - 18 GHz	18 GHz - 26.5 GHz
Horizontal	X	X	X	X	X
Vertical	X	Y	X	X	X

* The definition of the axis was listed in a 'Pre-check of the worst position' in APPENDIX.

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
6 dB Bandwidth	50 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 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
*1) Peak hold was applied as Worst-case measurement. *2) Reference data *3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013". *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.							

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

DATA OF CONDUCTED EMISSION TEST

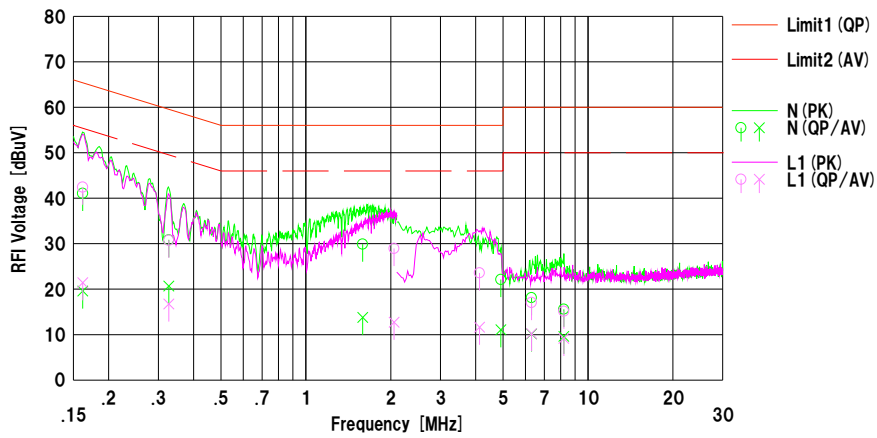
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Date : 2018/08/31

Mode : Tx IEEE802.11g 2462 MHz
Power : DC 5 V (USB)
Temp./Humi. : 20 deg.C / 62 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazutaka Takeyama



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.16200	28.67	7.19	12.38	41.05	19.57	65.36	55.36	24.3	35.7	N	
2	0.32700	18.45	8.28	12.39	30.84	20.67	59.53	49.53	28.6	28.8	N	
3	1.59100	17.41	1.32	12.47	29.88	13.79	56.00	46.00	26.1	32.2	N	
4	4.91200	9.44	-1.61	12.67	22.11	11.06	56.00	46.00	33.8	34.9	N	
5	6.31000	5.39	-2.58	12.73	18.12	10.15	60.00	50.00	41.8	39.8	N	
6	8.21100	2.75	-3.22	12.83	15.58	9.61	60.00	50.00	44.4	40.3	N	
7	0.16200	30.06	9.03	12.38	42.44	21.41	65.36	55.36	22.9	33.9	L1	
8	0.32700	18.35	4.33	12.39	30.74	16.72	59.53	49.53	28.7	32.8	L1	
9	2.05500	16.44	0.23	12.50	28.94	12.73	56.00	46.00	27.0	33.2	L1	
10	4.12700	10.94	-1.01	12.63	23.57	11.62	56.00	46.00	32.4	34.3	L1	
11	6.31000	4.32	-2.51	12.73	17.05	10.22	60.00	50.00	42.9	39.7	L1	
12	8.21100	2.31	-3.65	12.83	15.14	9.18	60.00	50.00	44.8	40.8	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) = SLS-02

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

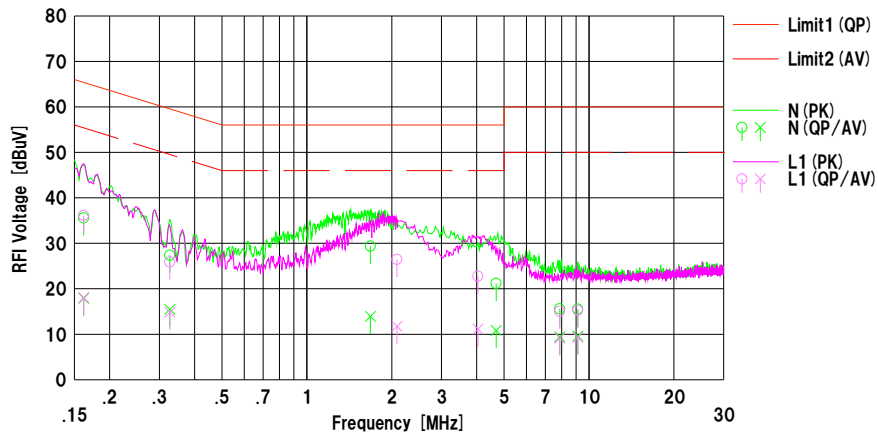
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Date : 2018/09/01

Mode : Tx BT LE 2440 MHz
Power : DC 5 V (USB)
Temp./Humi. : 20 deg.C / 62 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

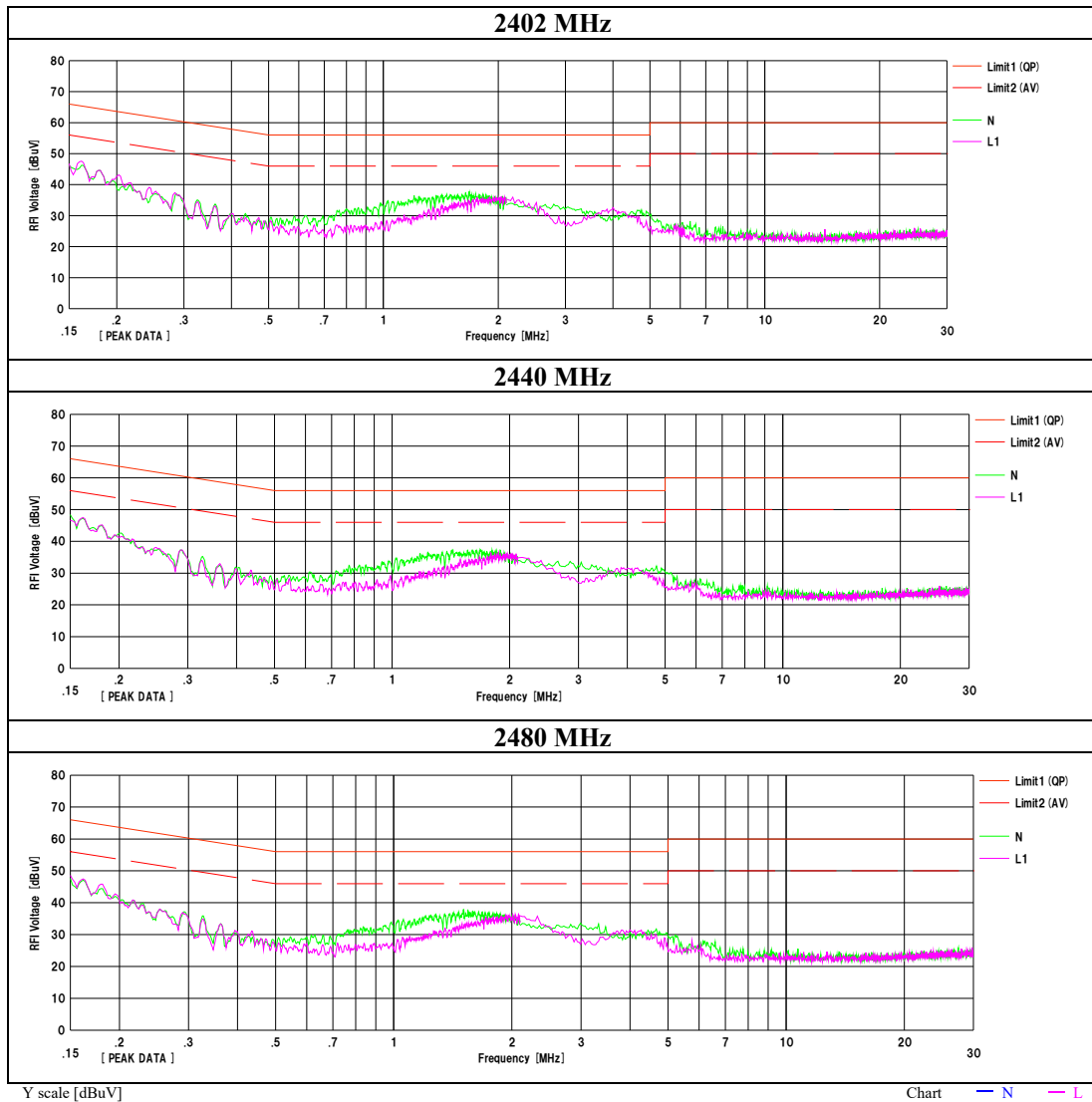
Engineer : Kazutaka Takeyama



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.16200	23.18	5.51	12.38	35.56	17.89	65.36	55.36	29.8	37.4	N	
2	0.32700	14.98	3.06	12.39	27.37	15.45	59.53	49.53	32.1	34.0	N	
3	1.68080	16.87	1.43	12.48	29.35	13.91	56.00	46.00	26.6	32.0	N	
4	4.69110	8.51	-1.83	12.66	21.17	10.83	56.00	46.00	34.8	35.1	N	
5	7.87600	2.76	-3.35	12.81	15.57	9.46	60.00	50.00	44.4	40.5	N	
6	9.13100	2.63	-3.26	12.87	15.50	9.61	60.00	50.00	44.5	40.3	N	
7	0.16200	23.73	5.65	12.38	36.11	18.03	65.36	55.36	29.2	37.3	L1	
8	0.32700	13.49	2.44	12.39	25.88	14.83	59.53	49.53	33.6	34.7	L1	
9	2.08690	13.94	-0.74	12.50	26.44	11.76	56.00	46.00	29.5	34.2	L1	
10	4.03890	10.14	-1.49	12.62	22.76	11.13	56.00	46.00	33.2	34.8	L1	
11	7.87600	2.21	-3.67	12.81	15.02	9.14	60.00	50.00	44.9	40.8	L1	
12	9.13100	2.38	-3.56	12.87	15.25	9.31	60.00	50.00	44.7	40.6	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN (AMN) + Cable + ATT) [dB]
LISN (AMN) = SLS-02

Conducted Emission

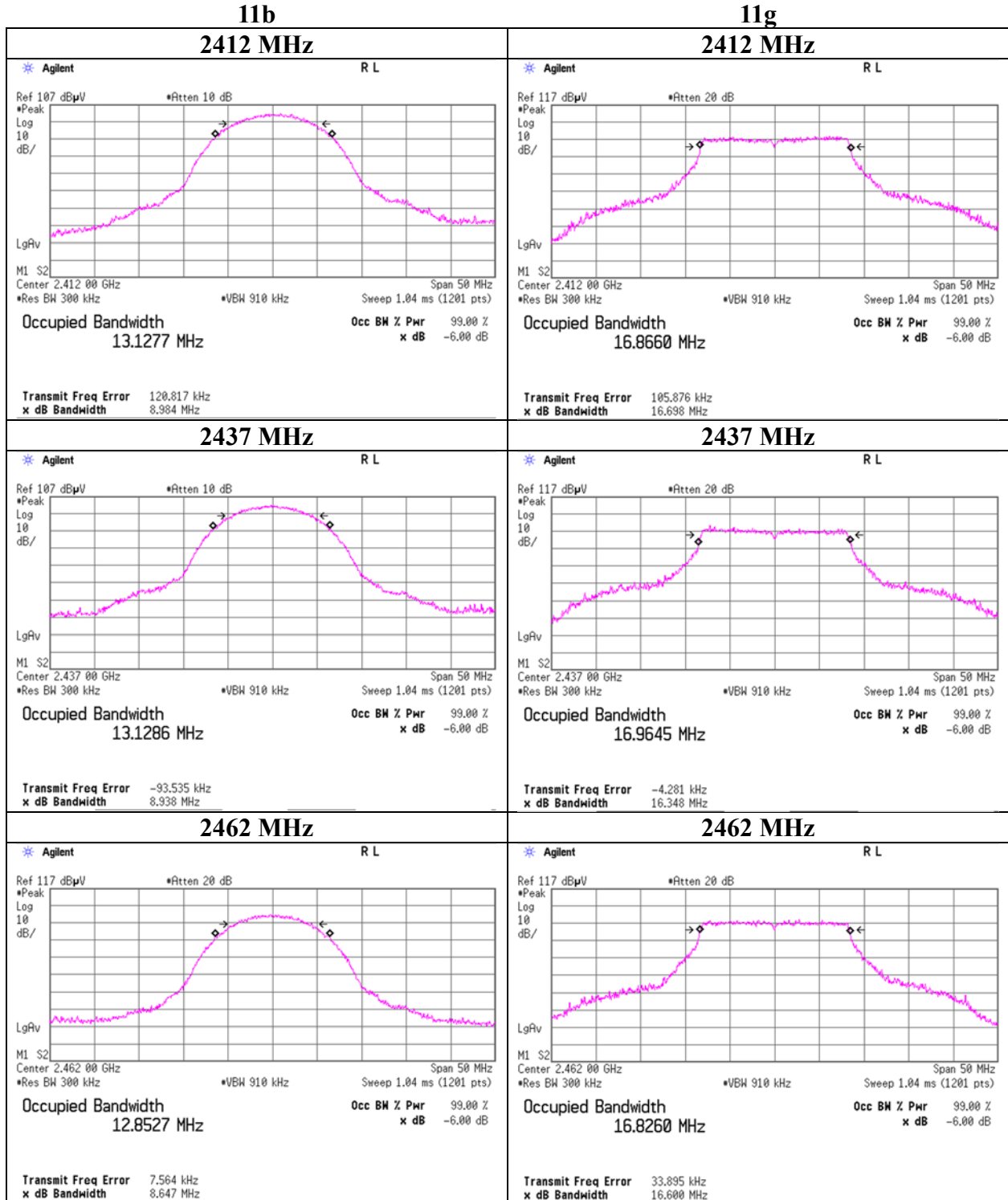


6 dB Bandwidth and 99 % Occupied Bandwidth

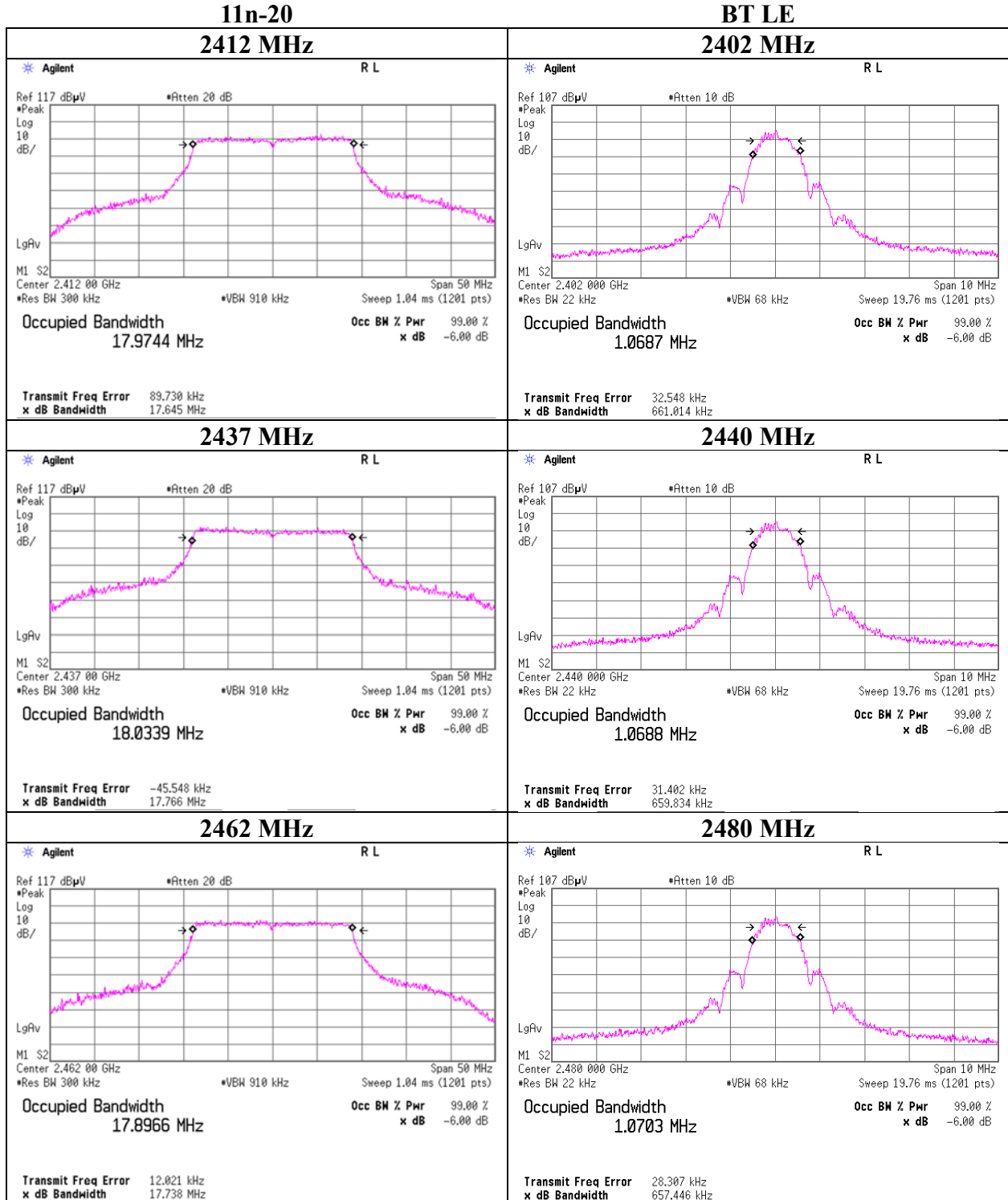
Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 24, 2018 September 3, 2018
Temperature / Humidity 26 deg. C / 54 % RH 24 deg. C / 57 % RH
Engineer Makoto Hosaka Shiro Kobayashi
Mode Tx Tx BT LE

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
11b	2412	13127.7	8.777	> 0.5000
	2437	13128.6	8.112	> 0.5000
	2462	12852.7	8.674	> 0.5000
11g	2412	16866.0	16.498	> 0.5000
	2437	16964.5	16.510	> 0.5000
	2462	16826.0	16.496	> 0.5000
11n-20	2412	17974.4	17.723	> 0.5000
	2437	18033.9	17.681	> 0.5000
	2462	17896.6	17.720	> 0.5000
BT LE	2402	1068.7	0.716	> 0.5000
	2440	1068.8	0.709	> 0.5000
	2480	1070.3	0.713	> 0.5000

99 % Occupied Bandwidth



99 % Occupied Bandwidth



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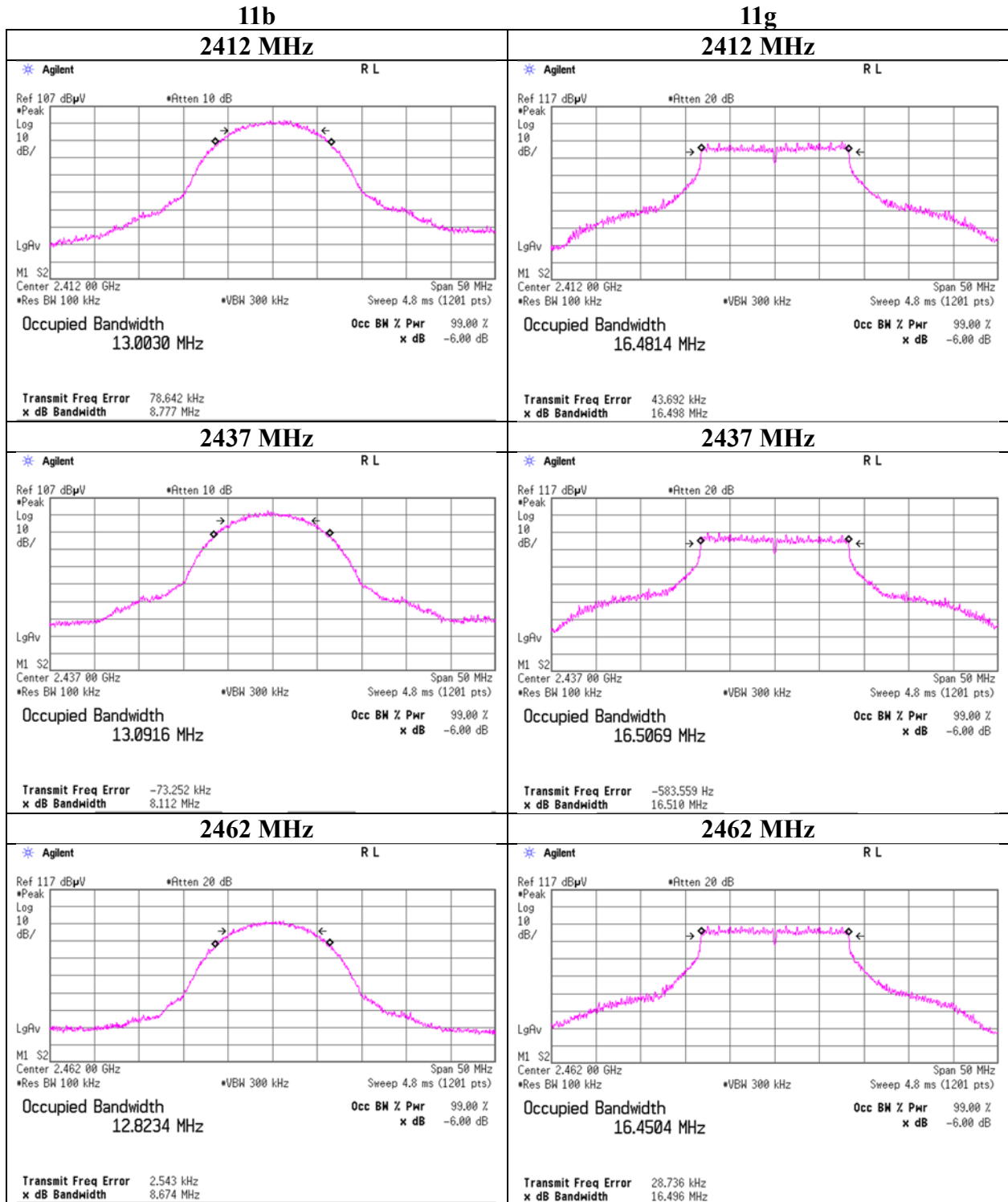
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

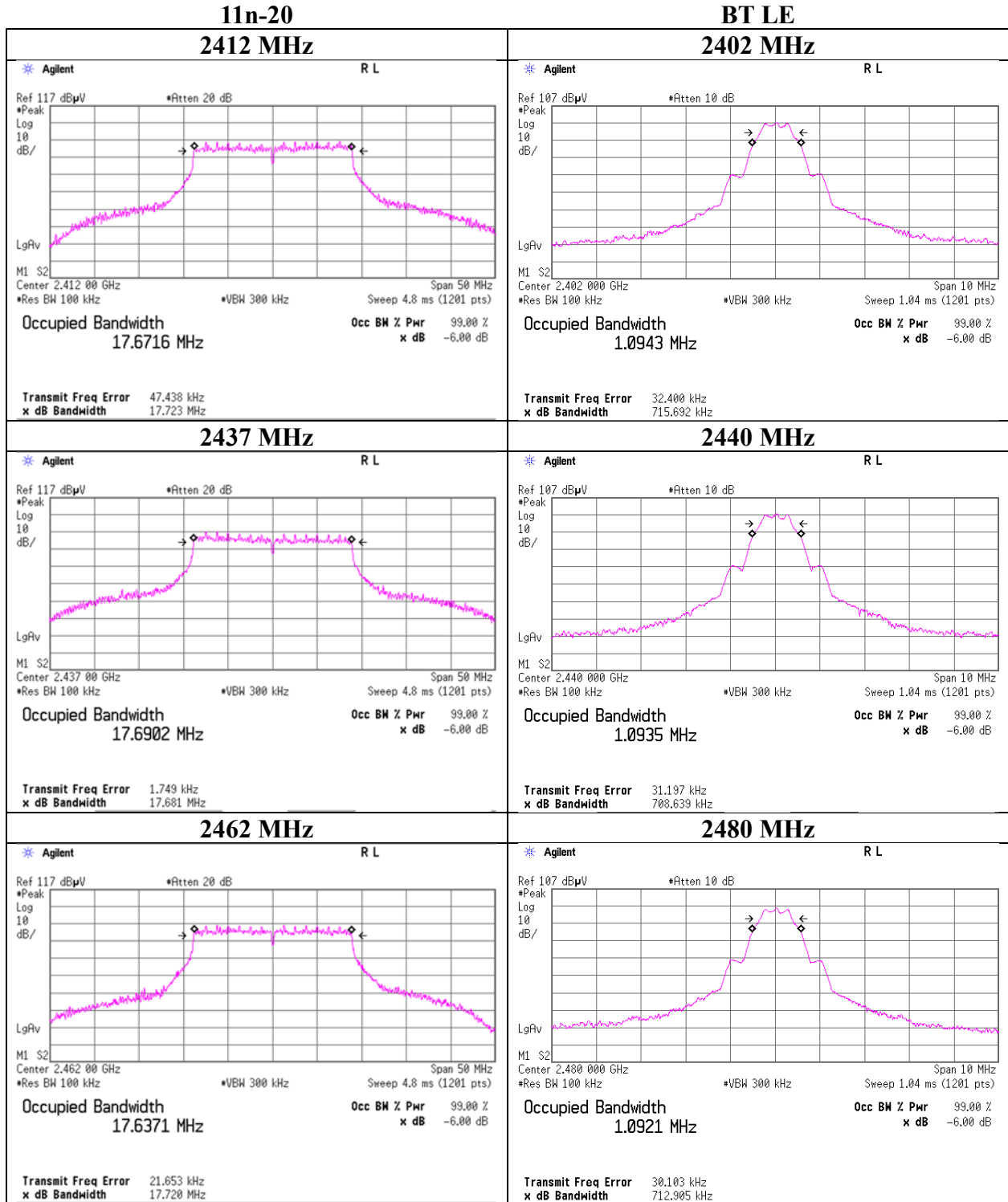
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6 dB Bandwidth



6 dB Bandwidth



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Maximum Peak Output Power

Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 24, 2018
Temperature / Humidity 26 deg. C / 54 % RH
Engineer Makoto Hosaka
Mode Tx 11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	2.94	1.91	9.68	14.53	28.38	30.00	1000	15.47	3.52	18.05	63.83	36.02	4000	17.97
2437	2.89	1.91	9.68	14.48	28.05	30.00	1000	15.52	3.52	18.00	63.10	36.02	4000	18.02
2462	2.82	1.92	9.67	14.41	27.61	30.00	1000	15.59	3.52	17.93	62.09	36.02	4000	18.09

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.

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
1 (Long)	2.60	
2 (Long)	2.43	
5.5 (Long)	2.70	
11 (Long)	2.85	
2 (Short)	2.65	
5.5 (Short)	2.72	
11 (Short)	2.89	*

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Maximum Peak Output Power

Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 24, 2018
Temperature / Humidity 26 deg. C / 54 % RH
Engineer Makoto Hosaka
Mode Tx 11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	8.96	1.91	9.68	20.55	113.50	30.00	1000	9.45	3.52	24.07	255.27	36.02	4000	11.95
2437	8.98	1.91	9.68	20.57	114.02	30.00	1000	9.43	3.52	24.09	256.45	36.02	4000	11.93
2462	9.55	1.92	9.67	21.14	130.02	30.00	1000	8.86	3.52	24.66	292.42	36.02	4000	11.36

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.

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	8.71	
9	8.45	
12	8.73	
18	8.74	
24	8.52	
36	8.71	
48	8.98	*
54	8.71	

*: Worst Rate

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

Maximum Peak Output Power

Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 24, 2018
Temperature / Humidity 26 deg. C / 54 % RH
Engineer Makoto Hosaka
Mode Tx 11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	9.16	1.91	9.68	20.75	118.85	30.00	1000	9.25	3.52	24.27	267.30	36.02	4000	11.75
2437	9.07	1.91	9.68	20.66	116.41	30.00	1000	9.34	3.52	24.18	261.82	36.02	4000	11.84
2462	9.38	1.92	9.67	20.97	125.03	30.00	1000	9.03	3.52	24.49	281.19	36.02	4000	11.53

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.

2437 MHz

MCS No.	Reading [dBm]	Remark
0	8.78	
1	8.91	
2	8.93	
3	8.88	
4	9.06	
5	8.88	
6	8.83	
7	9.07	*

*: Worst Rate

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

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Maximum Peak Output Power

Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date September 4, 2018
Temperature / Humidity 25 deg. C / 50 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-9.64	1.90	9.68	1.94	1.56	30.00	1000	28.06	3.52	5.46	3.52	36.02	4000	30.56
2440	-9.26	1.91	9.67	2.32	1.71	30.00	1000	27.68	3.52	5.84	3.84	36.02	4000	30.18
2480	-11.09	1.92	9.67	0.50	1.12	30.00	1000	29.50	3.52	4.02	2.52	36.02	4000	32.00

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.

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Average Output Power
(Reference data for SAR testing)

Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 24, 2018 September 3, 2018
Temperature / Humidity 26 deg. C / 54 % RH 24 deg. C / 57 % RH
Engineer Makoto Hosaka Shiro Kobayashi
Mode Tx Tx BT LE

11b 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-0.20	1.91	9.68	11.39	13.77	0.00	11.39	13.77
2437	-0.18	1.91	9.68	11.41	13.84	0.00	11.41	13.84
2462	-0.48	1.92	9.67	11.11	12.91	0.00	11.11	12.91

11g 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-0.19	1.91	9.68	11.40	13.80	0.02	11.42	13.87
2437	-0.46	1.91	9.68	11.13	12.97	0.02	11.15	13.03
2462	-0.26	1.92	9.67	11.33	13.58	0.02	11.35	13.65

11n-20 MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-0.19	1.91	9.68	11.40	13.80	0.02	11.42	13.87
2437	-0.08	1.91	9.68	11.51	14.16	0.02	11.53	14.22
2462	-0.30	1.92	9.67	11.29	13.46	0.02	11.31	13.52

BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-12.04	2.24	9.68	-0.12	0.97	1.82	1.70	1.48
2440	-11.67	2.28	9.67	0.28	1.07	1.82	2.10	1.62
2480	-13.62	2.28	9.67	-1.67	0.68	1.82	0.15	1.04

Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

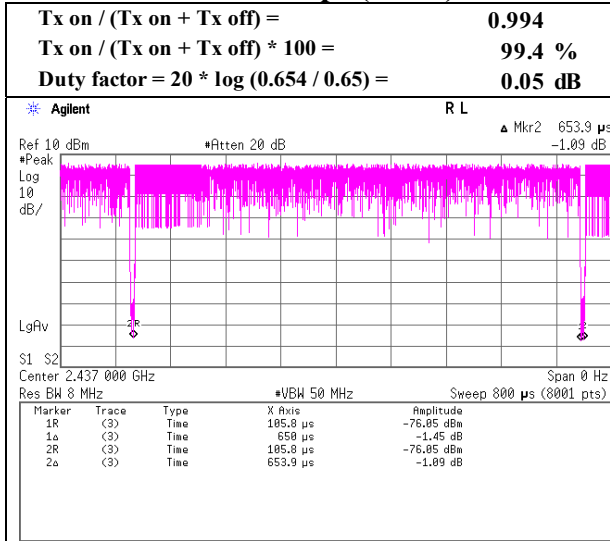
Result (Burst power average) = Time average + Duty factor

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.

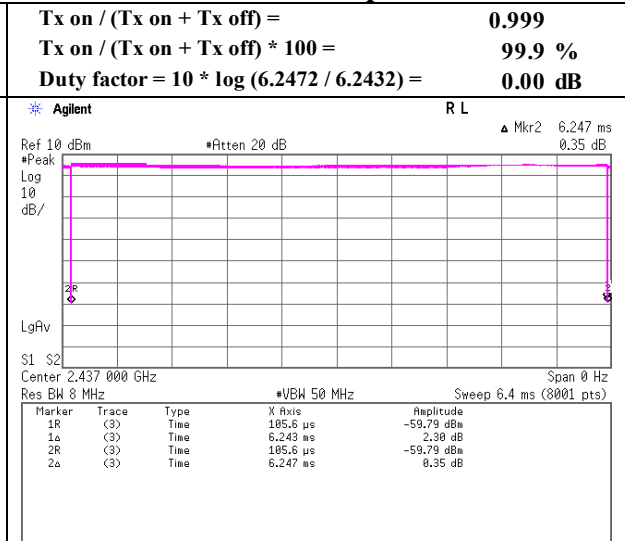
Duty factor confirmation

Report No.	12429781S-J-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 24, 2018
Temperature / Humidity	26 deg. C / 54 % RH
Engineer	Makoto Hosaka
Mode	Tx

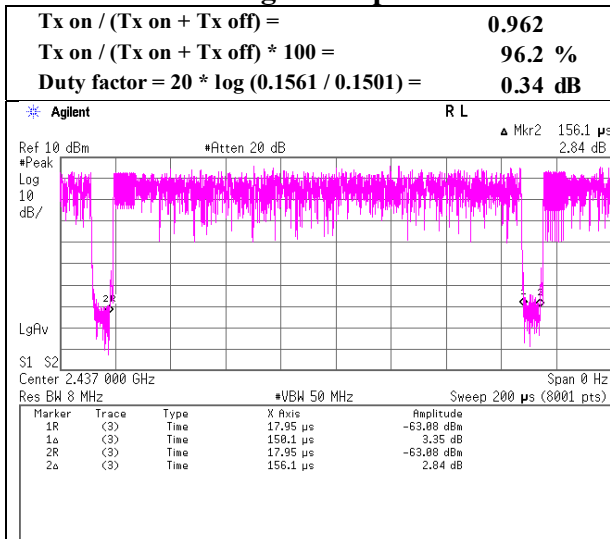
11b 11 Mbps (Short)



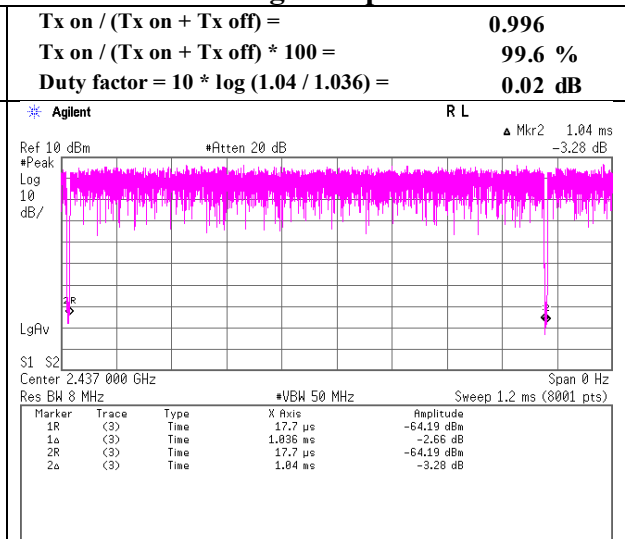
11b 1 Mbps



11g 48 Mbps



11g 6 Mbps

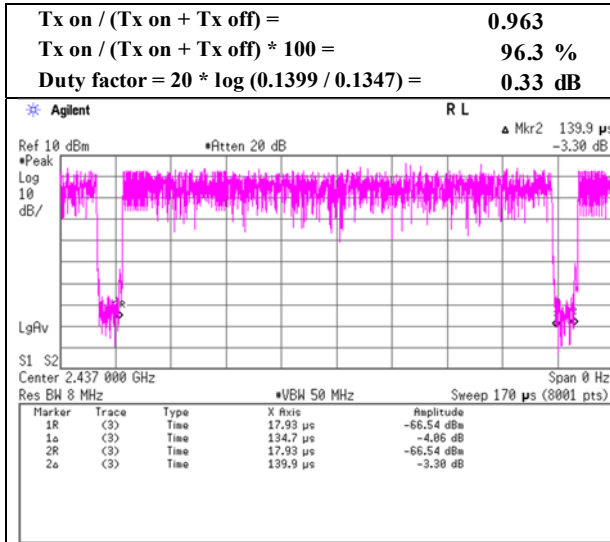


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

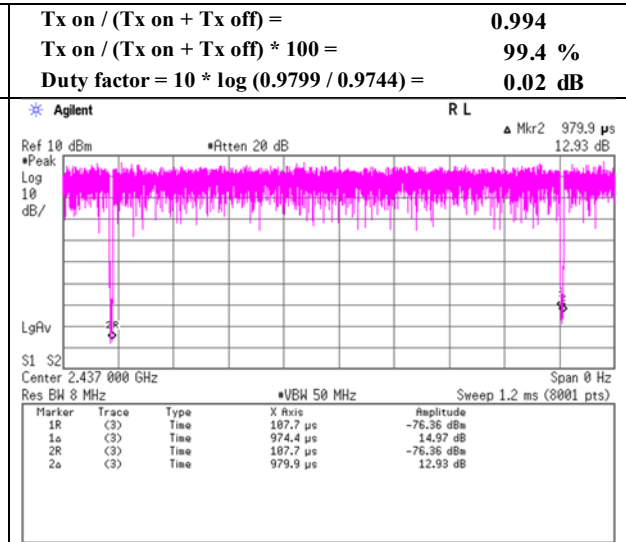
Duty factor confirmation

Report No.	12429781S-J-R2	
Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	August 24, 2018	September 3, 2018
Temperature / Humidity	26 deg. C / 54 % RH	24 deg. C / 57 % RH
Engineer	Makoto Hosaka	Shiro Kobayashi
Mode	Tx 11n-20	Tx BT LE

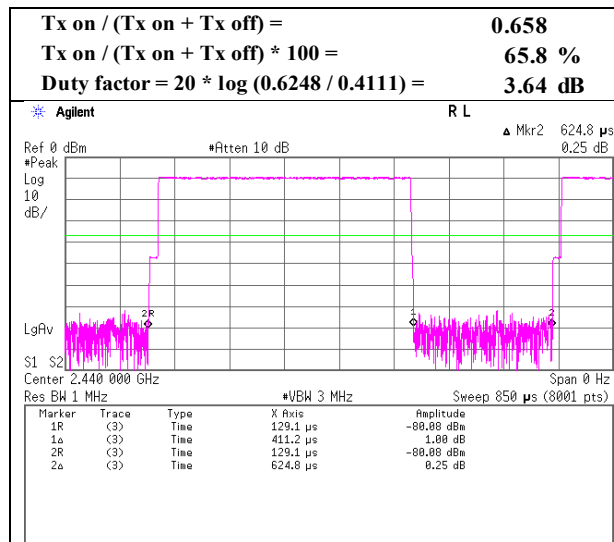
11n-20 MCS 7



11n-20 MCS 0



BT LE



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

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Radiated Spurious Emission

Report No.	12429781S-J-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3		
Date	August 28, 2018	August 29, 2018	August 30, 2018
Temperature / Humidity	22 deg. C / 64 % RH	21 deg. C / 50 % RH	20 deg. C / 49 % RH
Engineer	Makoto Hosaka (1 GHz - 13 GHz)	Kazutaka Takeyama (13 GHz - 18 GHz)	Kazutaka Takeyama (18 GHz - 26.5 GHz)
Mode	Tx 11b 2412 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	48.67	27.86	14.17	44.13	2.35	48.92	73.90	24.9	141	325	
Hori.	4824.000	PK	49.80	31.46	6.52	44.46	2.35	45.67	73.90	28.2	148	293	
Hori.	7236.000	PK	48.22	36.85	8.34	44.00	2.35	51.76	73.90	22.1	150	0	
Hori.	9648.000	PK	48.63	38.64	9.21	43.83	2.35	55.00	73.90	18.9	150	0	
Hori.	2390.000	AV	38.67	27.86	14.17	44.13	2.35	38.92	53.90	14.9	141	325	
Hori.	4824.000	AV	39.32	31.46	6.52	44.46	2.35	35.19	53.90	18.7	148	293	
Hori.	7236.000	AV	37.98	36.85	8.34	44.00	2.35	41.52	53.90	12.3	150	0	
Hori.	9648.000	AV	38.93	38.64	9.21	43.83	2.35	45.30	53.90	8.6	150	0	
Vert.	2390.000	PK	49.27	27.86	14.17	44.13	2.35	49.52	73.90	24.3	220	0	
Vert.	4824.000	PK	49.46	31.46	6.52	44.46	2.35	45.33	73.90	28.5	323	78	
Vert.	7236.000	PK	48.09	36.85	8.34	44.00	2.35	51.63	73.90	22.2	100	0	
Vert.	9648.000	PK	50.26	38.64	9.21	43.83	2.35	56.63	73.90	17.2	177	87	
Vert.	2390.000	AV	38.93	27.86	14.17	44.13	2.35	39.18	53.90	14.7	220	0	
Vert.	4824.000	AV	39.23	31.46	6.52	44.46	2.35	35.10	53.90	18.8	323	78	
Vert.	7236.000	AV	37.98	36.85	8.34	44.00	2.35	41.52	53.90	12.3	100	0	
Vert.	9648.000	AV	39.39	38.64	9.21	43.83	2.35	45.76	53.90	8.1	177	87	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	96.56	27.85	14.19	44.14	2.35	96.81	-	-	Carrier
Hori.	2400.000	PK	46.96	27.86	14.18	44.14	2.35	47.21	76.81	29.6	
Vert.	2412.000	PK	99.10	27.85	14.19	44.14	2.35	99.35	-	-	Carrier
Vert.	2400.000	PK	48.81	27.86	14.18	44.14	2.35	49.06	79.35	30.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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Shonan EMC Lab.

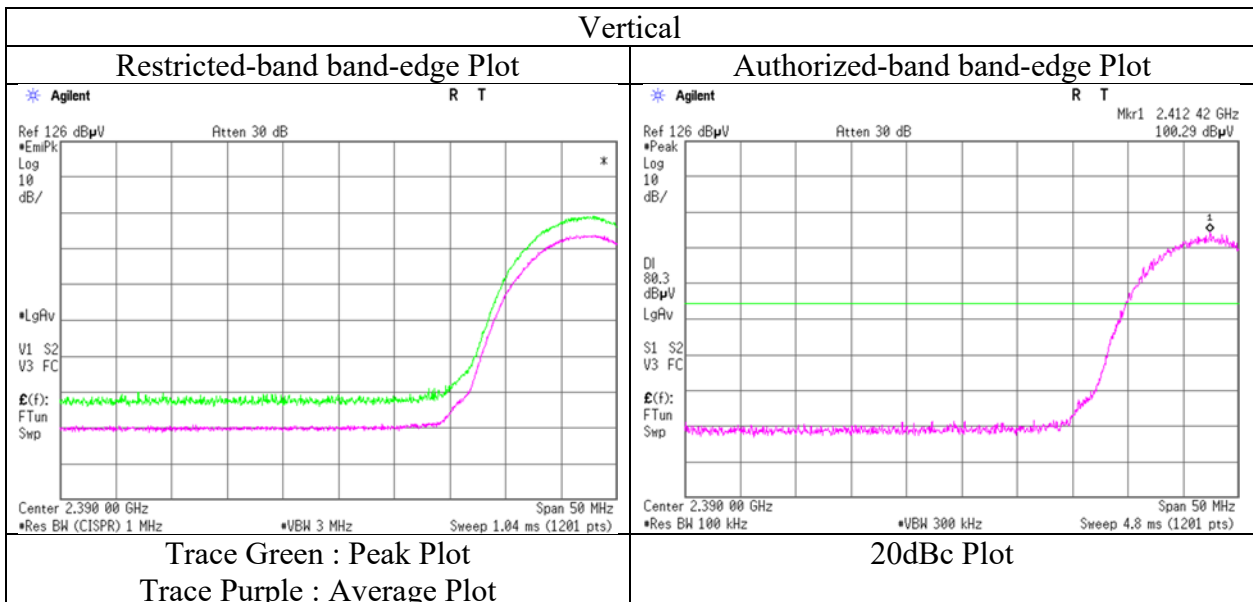
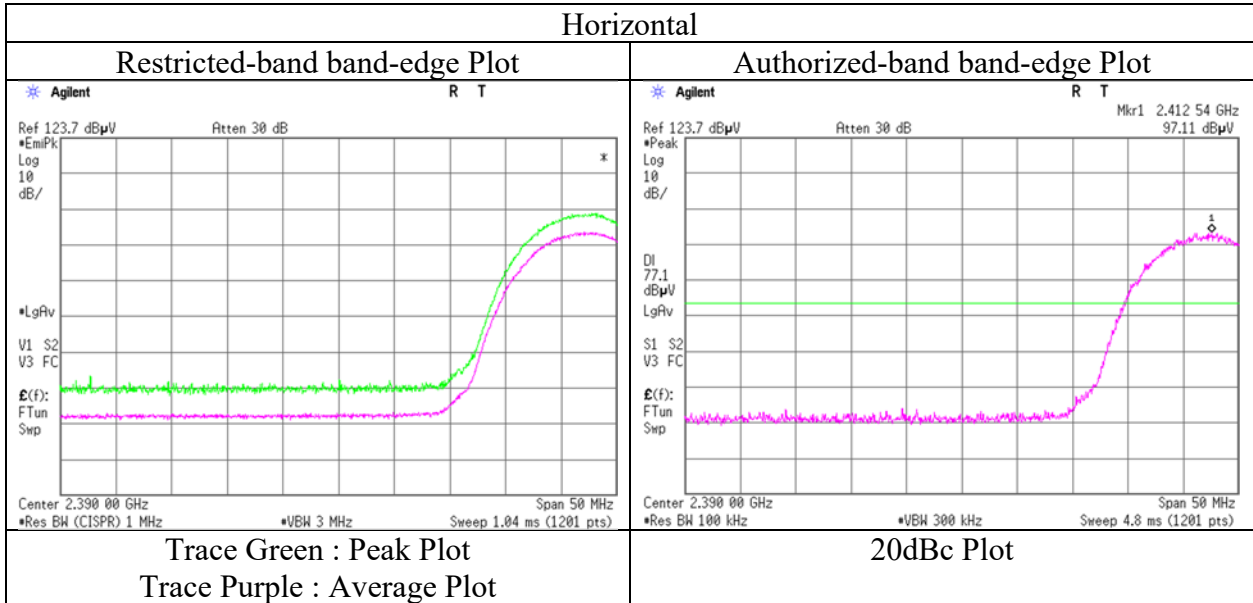
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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 28, 2018
Temperature / Humidity 22 deg. C / 64 % RH
Engineer Makoto Hosaka
(1 GHz - 13 GHz)
Mode Tx 11b 2412 MHz



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

Radiated Spurious Emission

Report No.	12429781S-J-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3		
Date	August 28, 2018	August 29, 2018	August 30, 2018
Temperature / Humidity	22 deg. C / 64 % RH	21 deg. C / 50 % RH	20 deg. C / 49 % RH
Engineer	Makoto Hosaka (1 GHz - 13 GHz)	Kazutaka Takeyama (13 GHz - 18 GHz)	Kazutaka Takeyama (18 GHz - 26.5 GHz)
Mode	Tx 11b 2437 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	52.11	31.40	6.52	44.47	2.35	47.91	73.90	25.9	142	282	
Hori.	7311.000	PK	47.94	36.99	8.40	44.03	2.35	51.65	73.90	22.2	150	0	
Hori.	9748.000	PK	48.05	38.92	9.22	43.84	2.35	54.70	73.90	19.2	158	281	
Hori.	4874.000	AV	42.09	31.40	6.52	44.47	2.35	37.89	53.90	16.0	142	282	
Hori.	7311.000	AV	38.23	36.99	8.40	44.03	2.35	41.94	53.90	11.9	150	0	
Hori.	9748.000	AV	38.95	38.92	9.22	43.84	2.35	45.60	53.90	8.3	158	281	
Vert.	4874.000	PK	49.49	31.40	6.52	44.47	2.35	45.29	73.90	28.6	136	238	
Vert.	7311.000	PK	47.42	36.99	8.40	44.03	2.35	51.13	73.90	22.7	150	0	
Vert.	9748.000	PK	48.04	38.92	9.22	43.84	2.35	54.69	73.90	19.2	254	80	
Vert.	4874.000	AV	40.15	31.40	6.52	44.47	2.35	35.95	53.90	17.9	136	238	
Vert.	7311.000	AV	38.27	36.99	8.40	44.03	2.35	41.98	53.90	11.9	150	0	
Vert.	9748.000	AV	38.92	38.92	9.22	43.84	2.35	45.57	53.90	8.3	254	80	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

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Radiated Spurious Emission

Report No.	12429781S-J-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3		
Date	August 28, 2018	August 29, 2018	August 30, 2018
Temperature / Humidity	22 deg. C / 64 % RH	21 deg. C / 50 % RH	20 deg. C / 49 % RH
Engineer	Makoto Hosaka (1 GHz - 13 GHz)	Kazutaka Takeyama (13 GHz - 18 GHz)	Kazutaka Takeyama (18 GHz - 26.5 GHz)
Mode	Tx 11b 2462 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.37	27.65	14.26	44.16	2.35	49.47	73.90	24.4	136	359	
Hori.	4924.000	PK	50.57	31.37	6.54	44.49	2.35	46.34	73.90	27.5	158	281	
Hori.	7386.000	PK	47.37	37.01	8.46	44.06	2.35	51.13	73.90	22.7	150	0	
Hori.	9848.000	PK	47.34	39.12	9.23	43.86	2.35	54.18	73.90	19.7	150	280	
Hori.	2483.500	AV	39.50	27.65	14.26	44.16	2.35	39.60	53.90	14.3	136	359	
Hori.	4924.000	AV	40.73	31.37	6.54	44.49	2.35	36.50	53.90	17.4	158	281	
Hori.	7386.000	AV	37.91	37.01	8.46	44.06	2.35	41.67	53.90	12.2	150	0	
Hori.	9848.000	AV	37.74	39.12	9.23	43.86	2.35	44.58	53.90	9.3	150	280	
Vert.	2483.500	PK	48.61	27.65	14.26	44.16	2.35	48.71	73.90	25.1	157	289	
Vert.	4924.000	PK	49.19	31.37	6.54	44.49	2.35	44.96	73.90	28.9	193	81	
Vert.	7386.000	PK	47.72	37.01	8.46	44.06	2.35	51.48	73.90	22.4	150	0	
Vert.	9848.000	PK	47.20	39.12	9.23	43.86	2.35	54.04	73.90	19.8	207	79	
Vert.	2483.500	AV	39.29	27.65	14.26	44.16	2.35	39.39	53.90	14.5	157	289	
Vert.	4924.000	AV	39.78	31.37	6.54	44.49	2.35	35.55	53.90	18.3	193	81	
Vert.	7386.000	AV	38.01	37.01	8.46	44.06	2.35	41.77	53.90	12.1	150	0	
Vert.	9848.000	AV	38.56	39.12	9.23	43.86	2.35	45.40	53.90	8.5	207	79	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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Shonan EMC Lab.

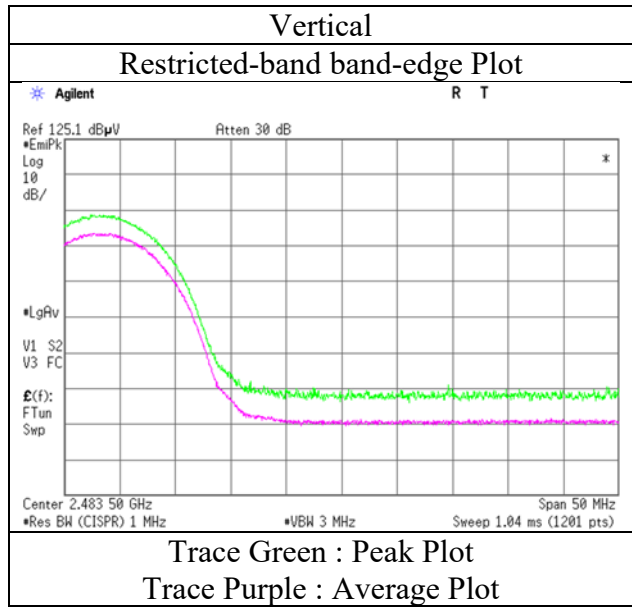
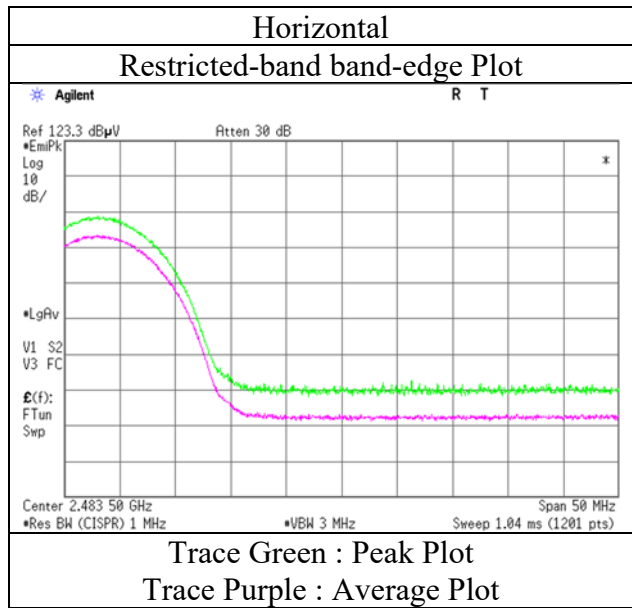
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12429781S-J-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	August 28, 2018
Temperature / Humidity	22 deg. C / 64 % RH
Engineer	Makoto Hosaka
	(1 GHz - 13 GHz)
Mode	Tx 11b 2462 MHz



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

Radiated Spurious Emission

Report No.	12429781S-J-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3		
Date	August 28, 2018	August 29, 2018	August 30, 2018
Temperature / Humidity	22 deg. C / 64 % RH	21 deg. C / 50 % RH	20 deg. C / 49 % RH
Engineer	Makoto Hosaka (1 GHz - 13 GHz)	Kazutaka Takeyama (13 GHz - 18 GHz)	Kazutaka Takeyama (18 GHz - 26.5 GHz)
Mode	Tx 11g 2412 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	54.80	27.86	14.17	44.13	2.35	55.05	73.90	18.8	140	326	
Hori.	4824.000	PK	48.98	31.46	6.52	44.46	2.35	44.85	73.90	29.0	148	285	
Hori.	7236.000	PK	48.34	36.85	8.34	44.00	2.35	51.88	73.90	22.0	150	0	
Hori.	9648.000	PK	49.08	38.64	9.21	43.83	2.35	55.45	73.90	18.4	150	0	
Vert.	2390.000	PK	59.49	27.86	14.17	44.13	2.35	59.74	73.90	14.1	153	306	
Vert.	4824.000	PK	48.53	31.46	6.52	44.46	2.35	44.40	73.90	29.5	150	0	
Vert.	7236.000	PK	47.93	36.85	8.34	44.00	2.35	51.47	73.90	22.4	150	0	
Vert.	9648.000	PK	50.36	38.64	9.21	43.83	2.35	56.73	73.90	17.1	131	272	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	41.29	27.86	14.17	44.13	0.34	2.35	41.88	53.90	12.0	*1)
Hori.	4824.000	AV	39.48	31.46	6.52	44.46	0.34	2.35	35.69	53.90	18.2	
Hori.	7236.000	AV	38.63	36.85	8.34	44.00	0.34	2.35	42.51	53.90	11.4	
Hori.	9648.000	AV	39.71	38.64	9.21	43.83	0.34	2.35	46.42	53.90	7.5	
Vert.	2390.000	AV	43.07	27.86	14.17	44.13	0.34	2.35	43.66	53.90	10.2	*1)
Vert.	4824.000	AV	39.50	31.46	6.52	44.46	0.34	2.35	35.71	53.90	18.2	
Vert.	7236.000	AV	38.62	36.85	8.34	44.00	0.34	2.35	42.50	53.90	11.4	
Vert.	9648.000	AV	40.19	38.64	9.21	43.83	0.34	2.35	46.90	53.90	7.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	93.58	27.85	14.19	44.14	2.35	93.83	-	-	Carrier
Hori.	2400.000	PK	64.25	27.86	14.18	44.14	2.35	64.50	73.83	9.3	
Vert.	2412.000	PK	96.67	27.85	14.19	44.14	2.35	96.92	-	-	Carrier
Vert.	2400.000	PK	61.05	27.86	14.18	44.14	2.35	61.30	76.92	15.6	

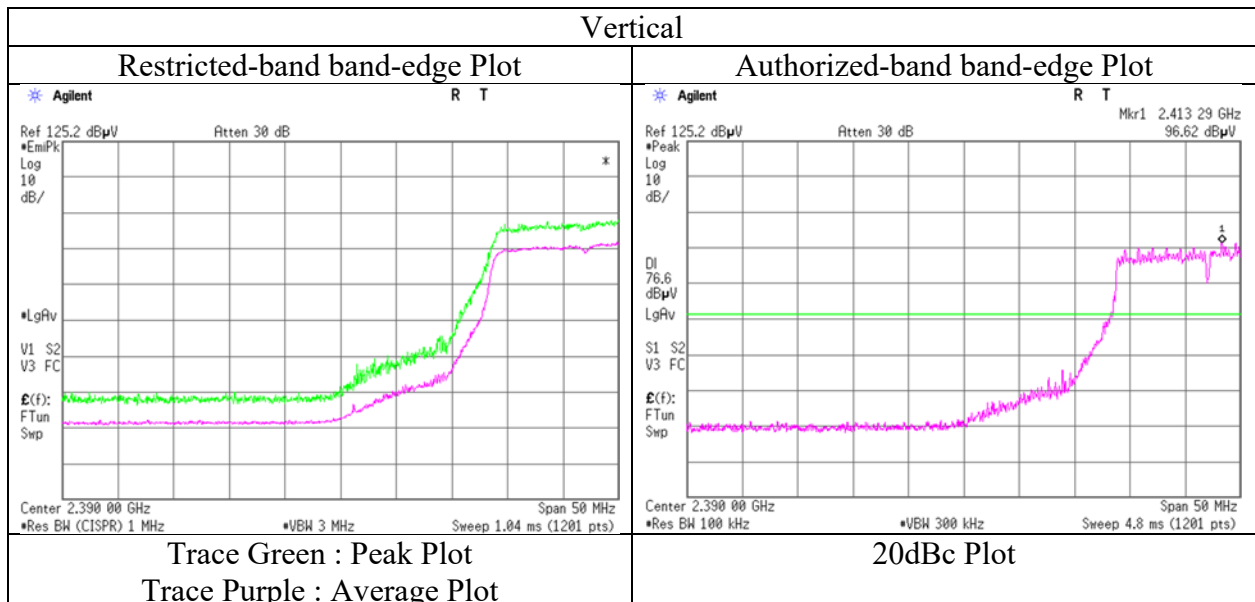
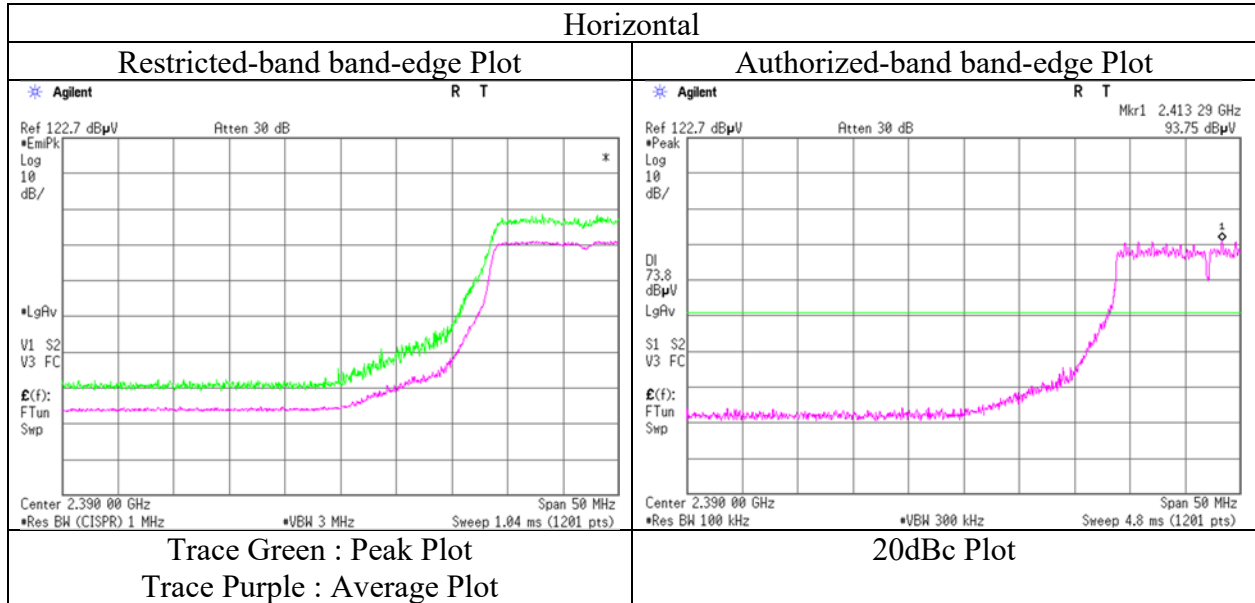
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date August 28, 2018
Temperature / Humidity 22 deg. C / 64 % RH
Engineer Makoto Hosaka
(1 GHz - 13 GHz)
Mode Tx 11g 2412 MHz



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

Radiated Spurious Emission

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 28, 2018 August 29, 2018 August 30, 2018
Temperature / Humidity 22 deg. C / 64 % RH 21 deg. C / 50 % RH 20 deg. C / 49 % RH
Engineer Makoto Hosaka Kazutaka Takeyama Kazutaka Takeyama
(1 GHz - 13 GHz) (13 GHz - 18 GHz) (18 GHz - 26.5 GHz)
Mode Tx 11g 2437 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	45.97	31.40	6.52	44.47	2.35	41.77	73.90	32.1	150	0	
Hori.	7311.000	PK	47.31	36.99	8.40	44.03	2.35	51.02	73.90	22.8	150	0	
Hori.	9748.000	PK	48.03	38.92	9.22	43.84	2.35	54.68	73.90	19.2	142	256	
Vert.	4874.000	PK	49.42	31.40	6.52	44.47	2.35	45.22	73.90	28.6	142	244	
Vert.	7311.000	PK	48.18	36.99	8.40	44.03	2.35	51.89	73.90	22.0	150	0	
Vert.	9748.000	PK	48.75	38.92	9.22	43.84	2.35	55.40	73.90	18.5	186	77	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	36.24	31.40	6.52	44.47	0.34	2.35	32.38	53.90	21.5	
Hori.	7311.000	AV	38.12	36.99	8.40	44.03	0.34	2.35	42.17	53.90	11.7	
Hori.	9748.000	AV	38.64	38.92	9.22	43.84	0.34	2.35	45.63	53.90	8.3	
Vert.	4874.000	AV	40.05	31.40	6.52	44.47	0.34	2.35	36.19	53.90	17.7	
Vert.	7311.000	AV	38.37	36.99	8.40	44.03	0.34	2.35	42.42	53.90	11.5	
Vert.	9748.000	AV	38.94	38.92	9.22	43.84	0.34	2.35	45.93	53.90	8.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 29, 2018 August 28, 2018 August 30, 2018
Temperature / Humidity 21 deg. C / 50 % RH 22 deg. C / 64 % RH 20 deg. C / 49 % RH
Engineer Kazutaka Takeyama Makoto Hosaka Kazutaka Takeyama
(1 GHz - 13 GHz) (13 GHz - 18 GHz) (18 GHz - 26.5 GHz)
(30 MHz - 1 GHz)
Mode Tx 11g 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	115.436	QP	32.85	12.63	7.23	32.15	0.00	20.56	43.50	22.9	253	261	
Hori.	288.912	QP	28.14	13.54	8.64	32.01	0.00	18.31	46.00	27.6	100	227	
Hori.	2483.500	PK	58.08	27.65	14.26	44.16	2.35	58.18	73.90	15.7	137	15	
Hori.	4924.000	PK	49.17	31.38	6.54	44.49	2.35	44.95	73.90	28.9	133	285	
Hori.	7386.000	PK	46.96	37.00	8.46	44.06	2.35	50.71	73.90	23.1	150	0	
Hori.	9848.000	PK	47.36	39.12	9.23	43.86	2.35	54.20	73.90	19.7	150	0	
Vert.	47.538	QP	34.18	12.10	6.76	32.19	0.00	20.85	40.00	19.1	100	266	
Vert.	52.685	QP	36.98	10.31	6.77	32.19	0.00	21.87	40.00	18.1	100	263	
Vert.	72.431	QP	38.19	6.41	6.98	32.18	0.00	19.40	40.00	20.6	100	141	
Vert.	127.509	QP	37.88	13.70	7.36	32.14	0.00	26.80	43.50	16.7	100	134	
Vert.	359.999	QP	26.87	15.19	9.07	31.95	0.00	19.18	46.00	26.8	100	154	
Vert.	2483.500	PK	59.34	27.65	14.26	44.16	2.35	59.44	73.90	14.4	155	294	
Vert.	4924.000	PK	49.16	31.38	6.54	44.49	2.35	44.94	73.90	28.9	146	124	
Vert.	7386.000	PK	47.21	37.00	8.46	44.06	2.35	50.96	73.90	22.9	150	0	
Vert.	9848.000	PK	46.96	39.12	9.23	43.86	2.35	53.80	73.90	20.1	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	41.12	27.65	14.26	44.16	0.34	2.35	41.56	53.90	12.3	*1)
Hori.	4924.000	AV	39.76	31.38	6.54	44.49	0.34	2.35	35.88	53.90	18.0	
Hori.	7386.000	AV	37.65	37.00	8.46	44.06	0.34	2.35	41.74	53.90	12.2	
Hori.	9848.000	AV	37.75	39.12	9.23	43.86	0.34	2.35	44.93	53.90	9.0	
Vert.	2483.500	AV	42.50	27.65	14.26	44.16	0.34	2.35	42.94	53.90	11.0	*1)
Vert.	4924.000	AV	39.46	31.38	6.54	44.49	0.34	2.35	35.58	53.90	18.3	
Vert.	7386.000	AV	38.23	37.00	8.46	44.06	0.34	2.35	42.32	53.90	11.6	
Vert.	9848.000	AV	37.84	39.12	9.23	43.86	0.34	2.35	45.02	53.90	8.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

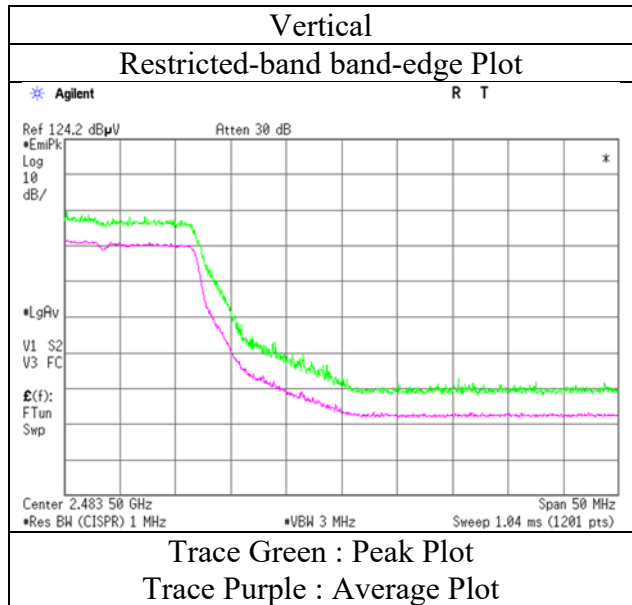
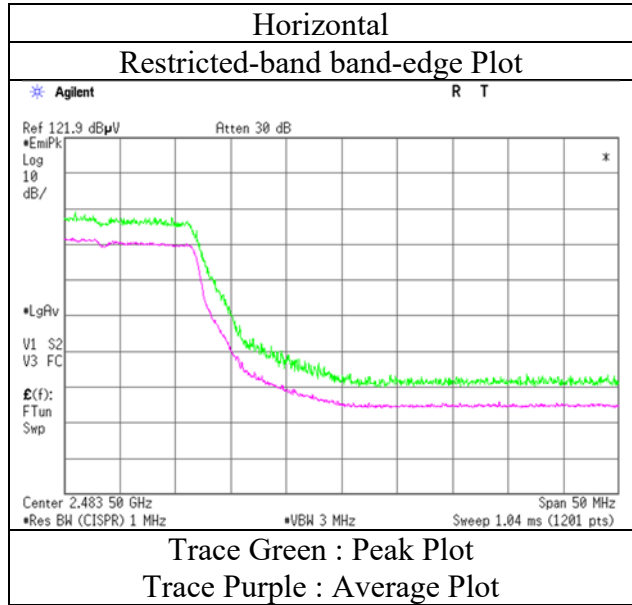
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12429781S-J-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	August 29, 2018
Temperature / Humidity	21 deg. C / 50 % RH
Engineer	Kazutaka Takeyama
	(1 GHz - 13 GHz)
Mode	Tx 11g 2462 MHz



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

Radiated Spurious Emission

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 28, 2018 August 29, 2018 August 30, 2018
Temperature / Humidity 26 deg. C / 49 % RH 21 deg. C / 50 % RH 20 deg. C / 49 % RH
Engineer Kazutaka Takeyama Kazutaka Takeyama Kazutaka Takeyama
(1 GHz - 13 GHz) (13 GHz - 18 GHz) (18 GHz - 26.5 GHz)
Mode Tx 11n-20 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	58.52	27.86	14.17	44.13	2.35	58.77	73.90	15.1	100	9	
Hori.	4824.000	PK	48.50	31.46	6.52	44.46	2.35	44.37	73.90	29.5	150	1	
Hori.	7236.000	PK	48.53	36.85	8.34	44.00	2.35	52.07	73.90	21.8	150	2	
Hori.	9648.000	PK	49.18	38.64	9.21	43.83	2.35	55.55	73.90	18.3	218	184	
Vert.	2390.000	PK	61.71	27.86	14.17	44.13	2.35	61.96	73.90	11.9	147	285	
Vert.	4824.000	PK	48.37	31.46	6.52	44.46	2.35	44.24	73.90	29.6	150	1	
Vert.	7236.000	PK	47.95	36.85	8.34	44.00	2.35	51.49	73.90	22.4	150	1	
Vert.	9648.000	PK	50.38	38.64	9.21	43.83	2.35	56.75	73.90	17.1	144	254	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	43.01	27.86	14.17	44.13	0.33	2.35	43.59	53.90	10.3	*1)
Hori.	4824.000	AV	39.28	31.46	6.52	44.46	0.33	2.35	35.48	53.90	18.4	
Hori.	7236.000	AV	38.92	36.85	8.34	44.00	0.33	2.35	42.79	53.90	11.1	
Hori.	9648.000	AV	40.10	38.64	9.21	43.83	0.33	2.35	46.80	53.90	7.1	
Vert.	2390.000	AV	45.98	27.86	14.17	44.13	0.33	2.35	46.56	53.90	7.3	*1)
Vert.	4824.000	AV	39.28	31.46	6.52	44.46	0.33	2.35	35.48	53.90	18.4	
Vert.	7236.000	AV	38.81	36.85	8.34	44.00	0.33	2.35	42.68	53.90	11.2	
Vert.	9648.000	AV	40.20	38.64	9.21	43.83	0.33	2.35	46.90	53.90	7.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	94.69	27.85	14.19	44.14	2.35	94.94	-	-	Carrier
Hori.	2400.000	PK	60.19	27.86	14.18	44.14	2.35	60.44	74.94	14.5	
Vert.	2412.000	PK	96.36	27.85	14.19	44.14	2.35	96.61	-	-	Carrier
Vert.	2400.000	PK	61.24	27.86	14.18	44.14	2.35	61.49	76.61	15.1	

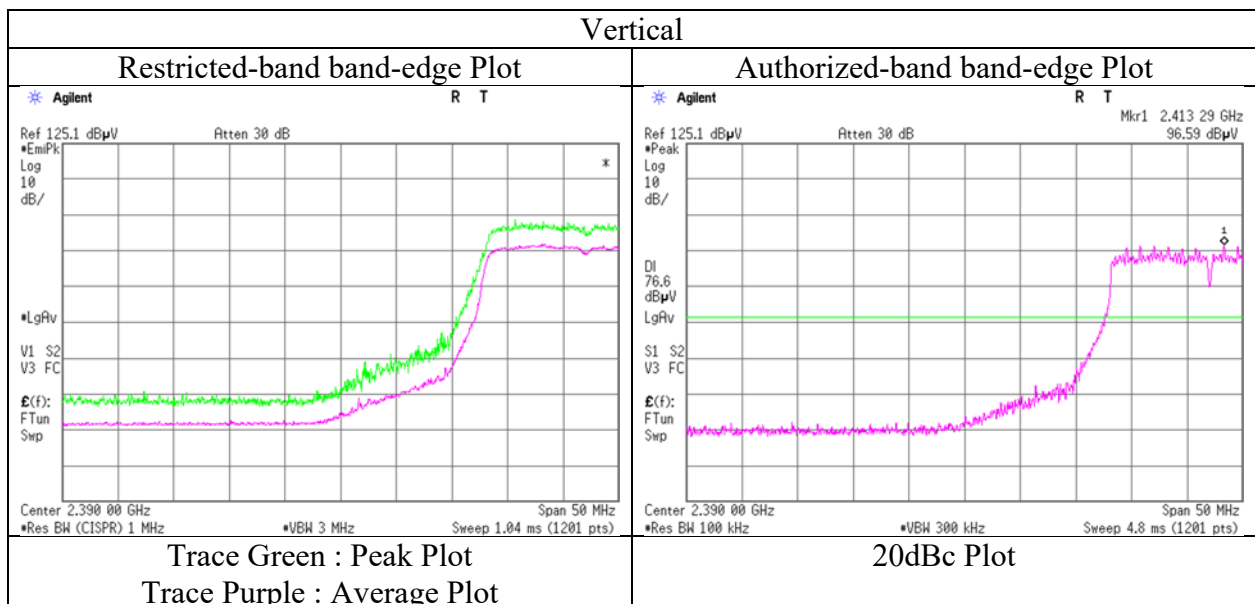
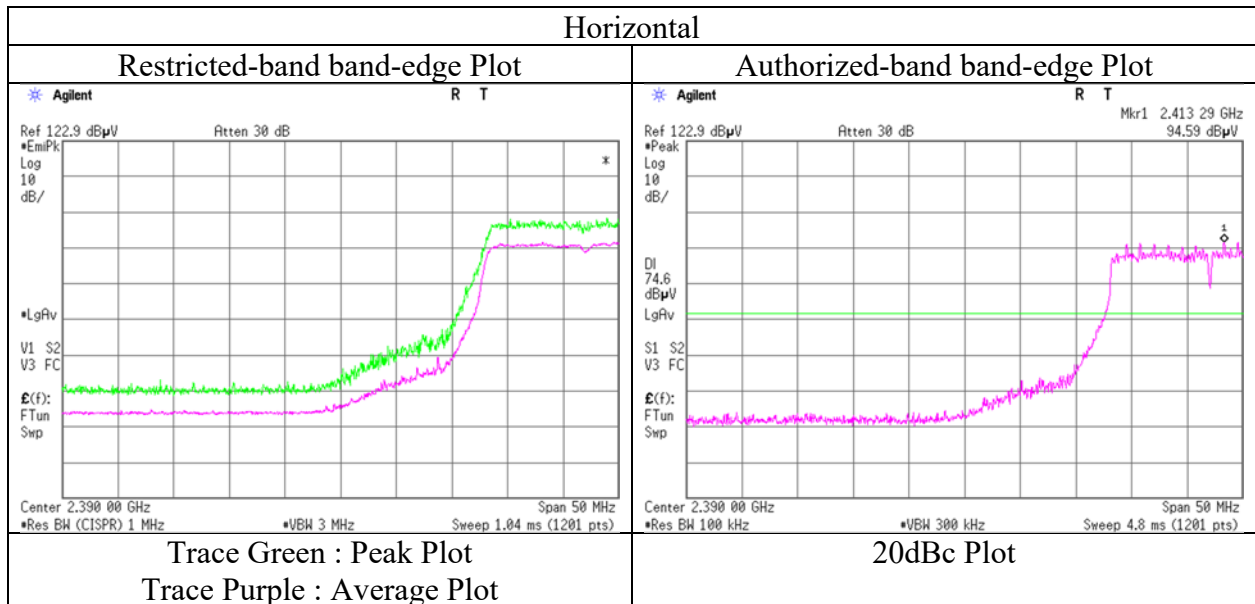
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 28, 2018
Temperature / Humidity 26 deg. C / 49 % RH
Engineer Kazutaka Takeyama
(1 GHz - 13 GHz)
Mode Tx 11n-20 2412 MHz



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

Radiated Spurious Emission

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 28, 2018 August 29, 2018 August 30, 2018
Temperature / Humidity 26 deg. C / 49 % RH 21 deg. C / 50 % RH 20 deg. C / 49 % RH
Engineer Kazutaka Takeyama Kazutaka Takeyama Kazutaka Takeyama
(1 GHz - 13 GHz) (13 GHz - 18 GHz) (18 GHz - 26.5 GHz)
Mode Tx 11n-20 2437 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	48.82	31.40	6.52	44.47	2.35	44.62	73.90	29.2	150	1	
Hori.	7311.000	PK	47.55	36.99	8.40	44.03	2.35	51.26	73.90	22.6	150	2	
Hori.	9748.000	PK	49.05	38.92	9.22	43.84	2.35	55.70	73.90	18.2	191	81	
Vert.	4874.000	PK	48.50	31.40	6.52	44.47	2.35	44.30	73.90	29.6	150	1	
Vert.	7311.000	PK	47.27	36.99	8.40	44.03	2.35	50.98	73.90	22.9	150	1	
Vert.	9748.000	PK	48.87	38.92	9.22	43.84	2.35	55.52	73.90	18.3	196	134	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	39.74	31.40	6.52	44.47	0.33	2.35	35.87	53.90	18.0	
Hori.	7311.000	AV	38.11	36.99	8.40	44.03	0.33	2.35	42.15	53.90	11.8	
Hori.	9748.000	AV	39.41	38.92	9.22	43.84	0.33	2.35	46.39	53.90	7.5	
Vert.	4874.000	AV	39.24	31.40	6.52	44.47	0.33	2.35	35.37	53.90	18.5	
Vert.	7311.000	AV	38.05	36.99	8.40	44.03	0.33	2.35	42.09	53.90	11.8	
Vert.	9748.000	AV	38.96	38.92	9.22	43.84	0.33	2.35	45.94	53.90	8.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Report No.	12429781S-J-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3		
Date	August 28, 2018	August 29, 2018	August 30, 2018
Temperature / Humidity	26 deg. C / 49 % RH	21 deg. C / 50 % RH	20 deg. C / 49 % RH
Engineer	Kazutaka Takeyama (1 GHz - 13 GHz)	Kazutaka Takeyama (13 GHz - 18 GHz)	Kazutaka Takeyama (18 GHz - 26.5 GHz)
Mode	Tx 11n-20 2462 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	57.17	27.65	14.26	44.16	2.35	57.27	73.90	16.6	224	19	
Hori.	4924.000	PK	48.83	31.37	6.54	44.49	2.35	44.60	73.90	29.3	150	2	
Hori.	7386.000	PK	47.91	37.01	8.46	44.06	2.35	51.67	73.90	22.2	150	1	
Hori.	9848.000	PK	47.93	39.12	9.23	43.86	2.35	54.77	73.90	19.1	243	137	
Vert.	2483.500	PK	59.94	27.65	14.26	44.16	2.35	60.04	73.90	13.8	139	84	
Vert.	4924.000	PK	48.57	31.37	6.54	44.49	2.35	44.34	73.90	29.5	150	1	
Vert.	7386.000	PK	47.32	37.01	8.46	44.06	2.35	51.08	73.90	22.8	150	1	
Vert.	9848.000	PK	47.94	39.12	9.23	43.86	2.35	54.78	73.90	19.1	103	255	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	43.22	27.65	14.26	44.16	0.33	2.35	43.65	53.90	10.3	*1)
Hori.	4924.000	AV	39.50	31.37	6.54	44.49	0.33	2.35	35.60	53.90	18.3	
Hori.	7386.000	AV	38.18	37.01	8.46	44.06	0.33	2.35	42.27	53.90	11.6	
Hori.	9848.000	AV	38.55	39.12	9.23	43.86	0.33	2.35	45.72	53.90	8.2	
Vert.	2483.500	AV	44.45	27.65	14.26	44.16	0.33	2.35	44.88	53.90	9.0	*1)
Vert.	4924.000	AV	39.24	31.37	6.54	44.49	0.33	2.35	35.34	53.90	18.6	
Vert.	7386.000	AV	38.30	37.01	8.46	44.06	0.33	2.35	42.39	53.90	11.5	
Vert.	9848.000	AV	38.49	39.12	9.23	43.86	0.33	2.35	45.66	53.90	8.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

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Shonan EMC Lab.

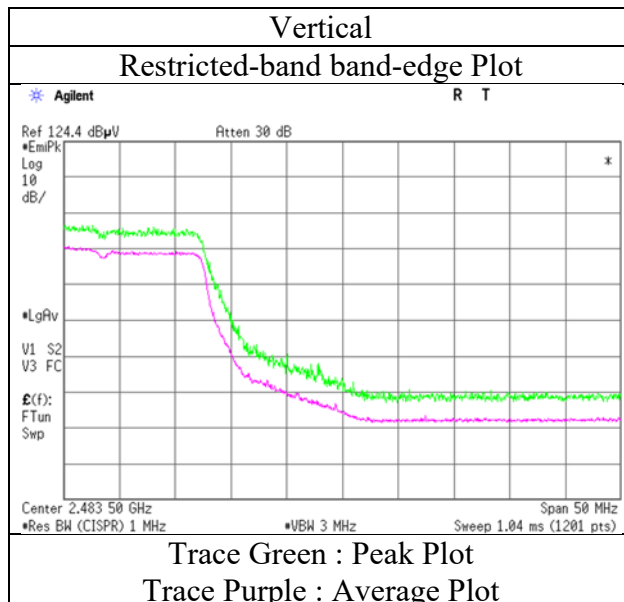
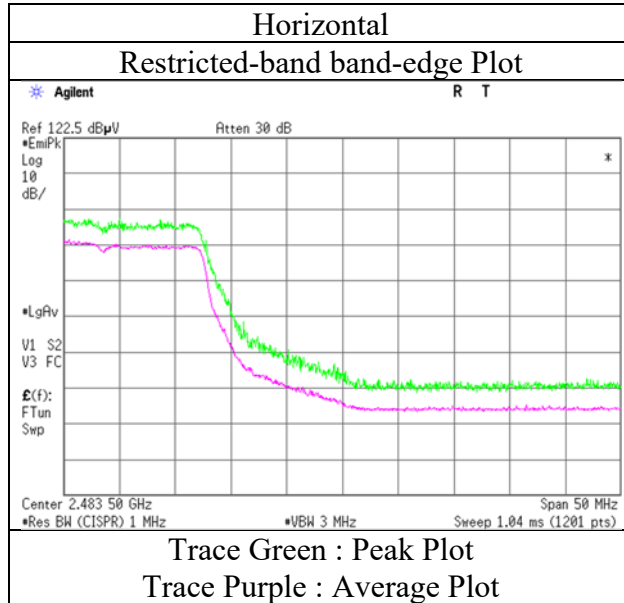
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12429781S-J-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	August 28, 2018
Temperature / Humidity	26 deg. C / 49 % RH
Engineer	Kazutaka Takeyama
	(1 GHz - 13 GHz)
Mode	Tx 11n-20 2462 MHz



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

Radiated Spurious Emission

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 30, 2018 August 27, 2018 August 29, 2018 August 31, 2018
Temperature / Humidity 20 deg. C / 49 % RH 24 deg. C / 56 % RH 21 deg. C / 50 % RH 20 deg. C / 62 % RH
Engineer Kazutaka Takeyama Makoto Hosaka Kazutaka Takeyama Kazutaka Takeyama
(30 MHz - 1 GHz) (1 GHz - 13 GHz) (13 GHz - 18 GHz) (18 GHz - 26.5 GHz)

Mode Tx BT LE 2402 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	115.129	QP	34.64	12.58	7.22	32.15	0.00	22.29	43.50	21.2	301	284	
Hori.	131.858	QP	28.83	14.07	7.43	32.13	0.00	18.20	43.50	25.3	286	122	
Hori.	289.540	QP	28.71	13.56	8.64	32.01	0.00	18.90	46.00	27.1	100	245	
Hori.	2390.000	PK	48.71	27.86	14.17	44.13	2.35	48.96	73.90	24.9	148	324	
Hori.	4804.000	PK	48.40	31.43	6.49	44.45	2.35	44.22	73.90	29.6	150	0	
Hori.	7206.000	PK	48.31	36.79	8.31	43.99	2.35	51.77	73.90	22.1	150	0	
Hori.	9608.000	PK	49.77	38.51	9.20	43.83	2.35	56.00	73.90	17.9	150	0	
Vert.	48.111	QP	37.16	11.89	6.77	32.19	0.00	23.63	40.00	16.3	100	152	
Vert.	54.466	QP	38.07	9.69	6.74	32.19	0.00	22.31	40.00	17.6	100	157	
Vert.	77.708	QP	38.09	6.36	7.40	32.17	0.00	19.68	40.00	20.3	100	197	
Vert.	119.284	QP	37.73	13.05	7.25	32.14	0.00	25.89	43.50	17.6	100	255	
Vert.	360.002	QP	23.47	15.19	9.07	31.95	0.00	15.78	46.00	30.2	100	147	
Vert.	2390.000	PK	48.34	27.86	14.17	44.13	2.35	48.59	73.90	25.3	218	72	
Vert.	4804.000	PK	48.60	31.43	6.49	44.45	2.35	44.42	73.90	29.4	150	0	
Vert.	7206.000	PK	47.91	36.79	8.31	43.99	2.35	51.37	73.90	22.5	150	0	
Vert.	9608.000	PK	49.78	38.51	9.20	43.83	2.35	56.01	73.90	17.8	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	38.15	27.86	14.17	44.13	3.64	2.35	42.04	53.90	11.9	*1)
Hori.	4804.000	AV	37.24	31.43	6.49	44.45	3.64	2.35	36.70	53.90	17.2	
Hori.	7206.000	AV	37.07	36.79	8.31	43.99	3.64	2.35	44.17	53.90	9.7	
Hori.	9608.000	AV	38.83	38.51	9.20	43.83	3.64	2.35	48.70	53.90	5.2	
Vert.	2390.000	AV	38.34	27.86	14.17	44.13	3.64	2.35	42.23	53.90	11.7	*1)
Vert.	4804.000	AV	37.64	31.43	6.49	44.45	3.64	2.35	37.10	53.90	16.8	
Vert.	7206.000	AV	37.75	36.79	8.31	43.99	3.64	2.35	44.85	53.90	9.1	
Vert.	9608.000	AV	38.42	38.51	9.20	43.83	3.64	2.35	48.29	53.90	5.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	95.68	27.86	14.18	44.14	2.35	95.93	-	-	
Hori.	2400.000	PK	41.66	27.86	14.18	44.14	2.35	41.91	75.93	34.0	
Vert.	2402.000	PK	97.20	27.86	14.18	44.14	2.35	97.45	-	-	
Vert.	2400.000	PK	43.68	27.86	14.18	44.14	2.35	43.93	77.45	33.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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Shonan EMC Lab.

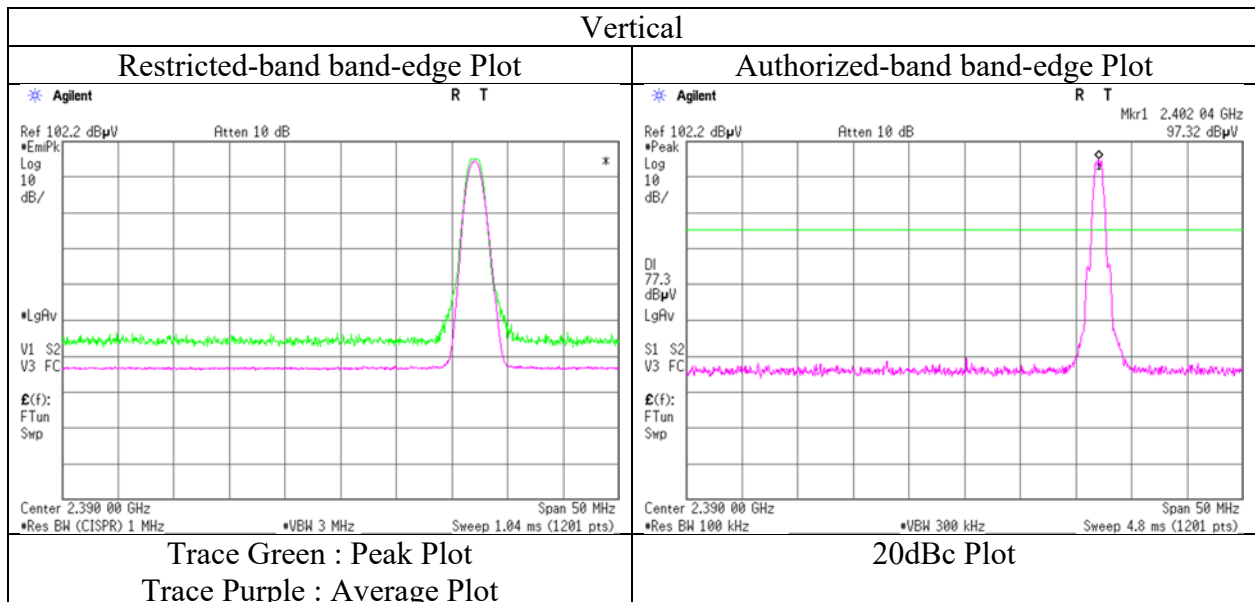
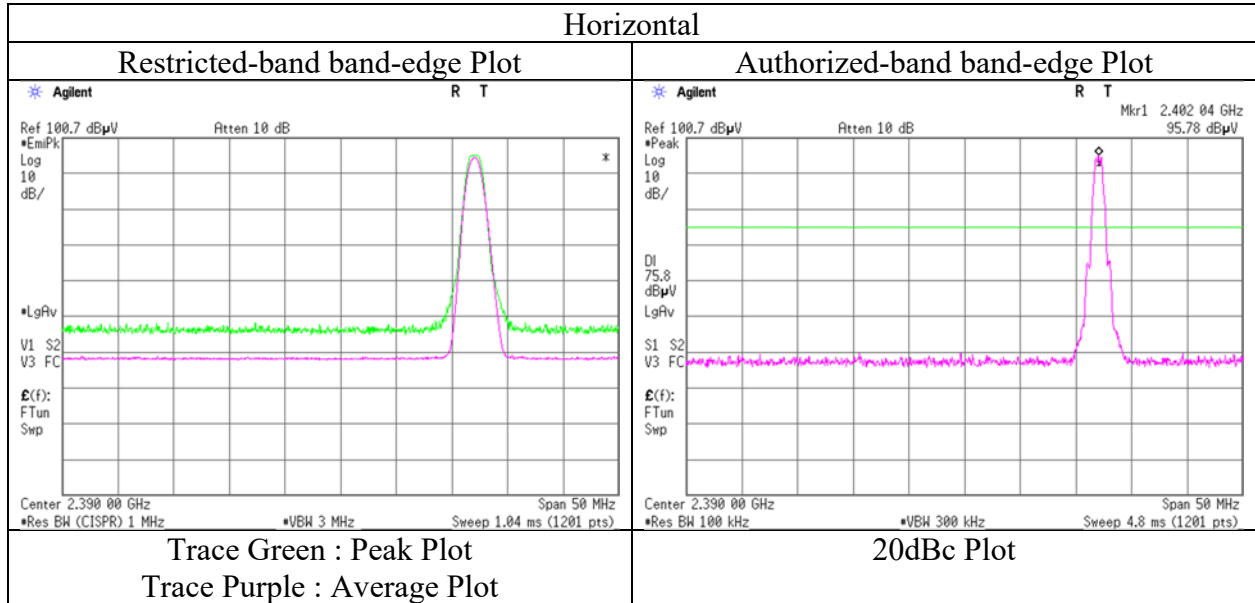
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 28, 2018
Temperature / Humidity 26 deg. C / 49 % RH
Engineer Kazutaka Takeyama
(1 GHz - 13 GHz)
Mode Tx BT LE 2402 MHz



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

Radiated Spurious Emission

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 30, 2018 August 27, 2018 August 29, 2018 August 31, 2018
Temperature / Humidity 20 deg. C / 49 % RH 24 deg. C / 56 % RH 21 deg. C / 50 % RH 20 deg. C / 62 % RH
Engineer Kazutaka Takeyama Makoto Hosaka Kazutaka Takeyama Kazutaka Takeyama
(30 MHz - 1 GHz) (1 GHz - 13 GHz) (13 GHz - 18 GHz) (18 GHz - 26.5 GHz)

Mode Tx BT LE 2440 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	115.251	QP	36.19	12.60	7.23	32.15	0.00	23.87	43.50	19.6	303	221	
Hori.	289.286	QP	27.76	13.55	8.64	32.01	0.00	17.94	46.00	28.0	100	266	
Hori.	4880.000	PK	48.06	31.37	6.53	44.48	2.35	43.83	73.90	30.0	150	1	
Hori.	7320.000	PK	47.13	37.00	8.40	44.03	2.35	50.85	73.90	23.0	150	1	
Hori.	9760.000	PK	47.63	38.92	9.22	43.85	2.35	54.27	73.90	19.6	150	2	
Vert.	48.285	QP	36.78	11.83	6.77	32.19	0.00	23.19	40.00	16.8	100	267	
Vert.	54.365	QP	37.88	9.72	6.74	32.19	0.00	22.15	40.00	17.8	100	261	
Vert.	77.703	QP	38.27	6.36	7.40	32.17	0.00	19.86	40.00	20.1	100	152	
Vert.	121.249	QP	37.18	13.20	7.27	32.14	0.00	25.51	43.50	17.9	100	238	
Vert.	360.006	QP	23.44	15.19	9.07	31.95	0.00	15.75	46.00	30.2	100	156	
Vert.	4880.000	PK	48.29	31.37	6.53	44.48	2.35	44.06	73.90	29.8	150	2	
Vert.	7320.000	PK	47.33	37.00	8.40	44.03	2.35	51.05	73.90	22.8	150	2	
Vert.	9760.000	PK	47.91	38.92	9.22	43.85	2.35	54.55	73.90	19.3	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	38.84	31.37	6.53	44.48	3.64	2.35	38.25	53.90	15.7	
Hori.	7320.000	AV	38.24	37.00	8.40	44.03	3.64	2.35	45.60	53.90	8.3	
Hori.	9760.000	AV	38.45	38.92	9.22	43.85	3.64	2.35	48.73	53.90	5.2	
Vert.	4880.000	AV	39.16	31.37	6.53	44.48	3.64	2.35	38.57	53.90	15.3	
Vert.	7320.000	AV	38.43	37.00	8.40	44.03	3.64	2.35	45.79	53.90	8.1	
Vert.	9760.000	AV	38.30	38.92	9.22	43.85	3.64	2.35	48.58	53.90	5.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.93\text{ m} / 3.0\text{ m}) = 2.35\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

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Radiated Spurious Emission

Report No. 12429781S-J-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date August 30, 2018 August 27, 2018 August 29, 2018 August 31, 2018
Temperature / Humidity 20 deg. C / 49 % RH 24 deg. C / 56 % RH 21 deg. C / 50 % RH 20 deg. C / 62 % RH
Engineer Kazutaka Takeyama Makoto Hosaka Kazutaka Takeyama Kazutaka Takeyama
(30 MHz - 1 GHz) (1 GHz - 13 GHz) (13 GHz - 18 GHz) (18 GHz - 26.5 GHz)

Mode Tx BT LE 2480 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	115.372	QP	36.11	12.62	7.23	32.15	0.00	23.81	43.50	19.6	301	107	
Hori.	289.054	QP	28.55	13.55	8.64	32.01	0.00	18.73	46.00	27.2	100	257	
Hori.	2483.500	PK	48.89	27.65	14.26	44.16	2.35	48.99	73.90	24.9	141	315	
Hori.	4960.000	PK	48.37	31.54	6.56	44.51	2.35	44.31	73.90	29.5	150	1	
Hori.	7440.000	PK	47.57	37.10	8.50	44.08	2.35	51.44	73.90	22.4	150	2	
Hori.	9920.000	PK	47.46	38.97	9.25	43.87	2.35	54.16	73.90	19.7	150	1	
Vert.	48.265	QP	36.77	11.84	6.77	32.19	0.00	23.19	40.00	16.8	100	209	
Vert.	54.245	QP	37.89	9.76	6.75	32.19	0.00	22.21	40.00	17.7	100	195	
Vert.	77.712	QP	37.94	6.36	7.40	32.17	0.00	19.53	40.00	20.4	100	137	
Vert.	119.165	QP	38.17	13.04	7.25	32.14	0.00	26.32	43.50	17.1	100	234	
Vert.	360.001	QP	23.52	15.19	9.07	31.95	0.00	15.83	46.00	30.1	100	187	
Vert.	2483.500	PK	48.43	27.65	14.26	44.16	2.35	48.53	73.90	25.3	149	80	
Vert.	4960.000	PK	48.84	31.54	6.56	44.51	2.35	44.78	73.90	29.1	150	1	
Vert.	7440.000	PK	47.76	37.10	8.50	44.08	2.35	51.63	73.90	22.2	150	1	
Vert.	9920.000	PK	46.97	38.97	9.25	43.87	2.35	53.67	73.90	20.2	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	39.51	27.65	14.26	44.16	3.64	2.35	43.25	53.90	10.7	*1)
Hori.	4960.000	AV	39.54	31.54	6.56	44.51	3.64	2.35	39.12	53.90	14.8	
Hori.	7440.000	AV	38.16	37.10	8.50	44.08	3.64	2.35	45.67	53.90	8.2	
Hori.	9920.000	AV	37.68	38.97	9.25	43.87	3.64	2.35	48.02	53.90	5.9	
Vert.	2483.500	AV	39.66	27.65	14.26	44.16	3.64	2.35	43.40	53.90	10.5	*1)
Vert.	4960.000	AV	39.58	31.54	6.56	44.51	3.64	2.35	39.16	53.90	14.7	
Vert.	7440.000	AV	38.08	37.10	8.50	44.08	3.64	2.35	45.59	53.90	8.3	
Vert.	9920.000	AV	37.88	38.97	9.25	43.87	3.64	2.35	48.22	53.90	5.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.93 m / 3.0 m) = 2.35 dB

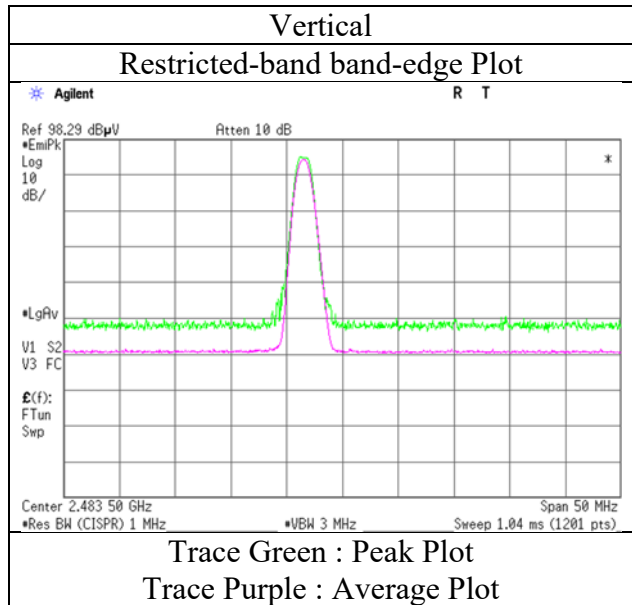
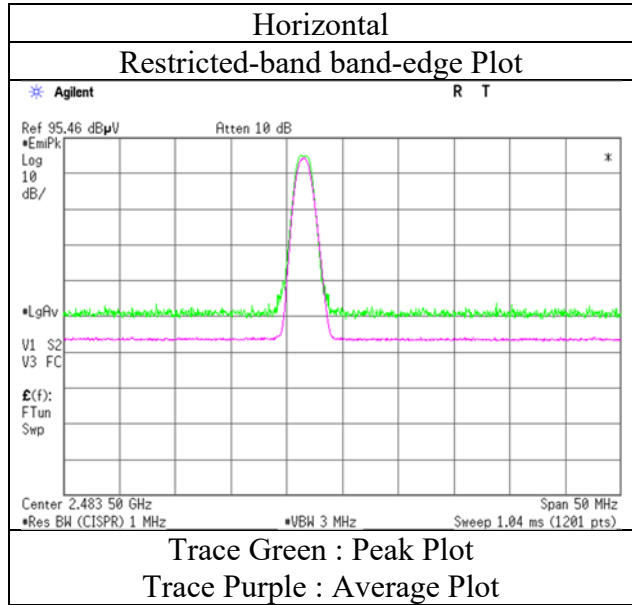
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

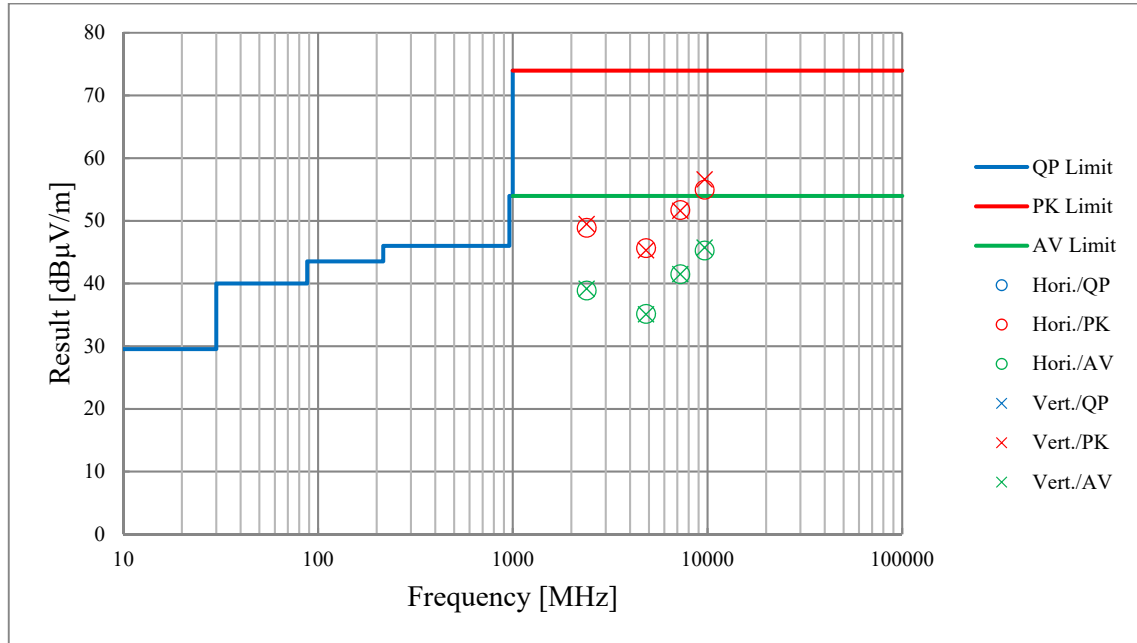
Report No.	12429781S-J-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	August 27, 2018
Temperature / Humidity	24 deg. C / 56 % RH
Engineer	Makoto Hosaka
	(1 GHz - 13 GHz)
Mode	Tx BT LE 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

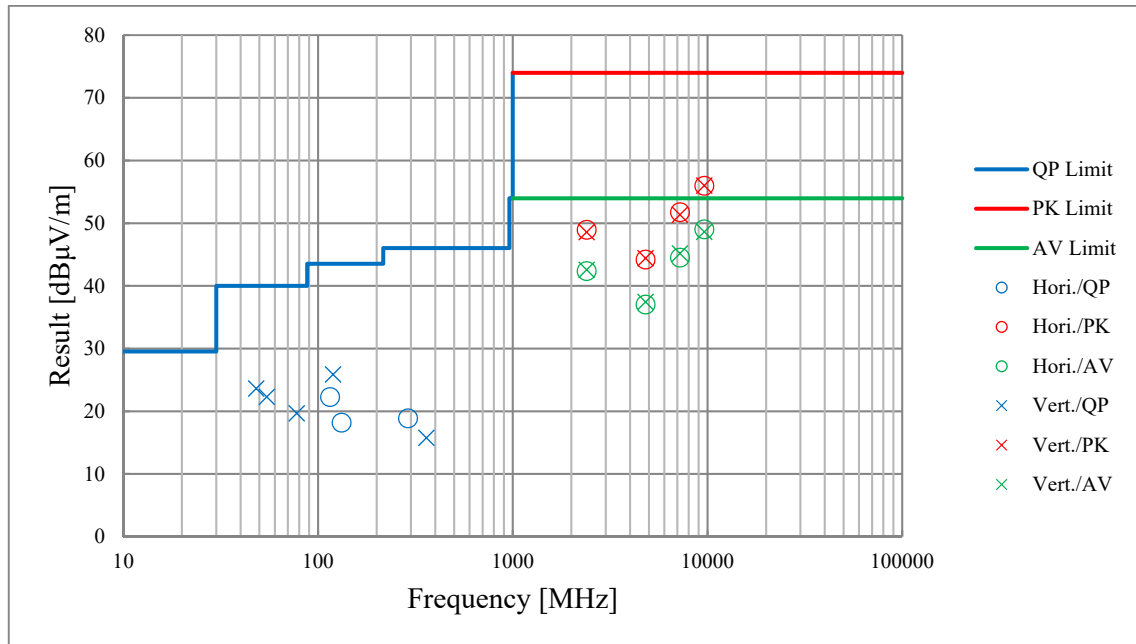
Report No.	12429781S-J-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3		
Date	August 28, 2018	August 29, 2018	August 30, 2018
Temperature / Humidity	22 deg. C / 64 % RH	21 deg. C / 50 % RH	20 deg. C / 49 % RH
Engineer	Makoto Hosaka (1 GHz - 13 GHz)	Kazutaka Takeyama (13 GHz - 18 GHz)	Kazutaka Takeyama (18 GHz - 26.5 GHz)
Mode	Tx 11b 2412 MHz		



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

Radiated Spurious Emission
(Plot data, Worst case)

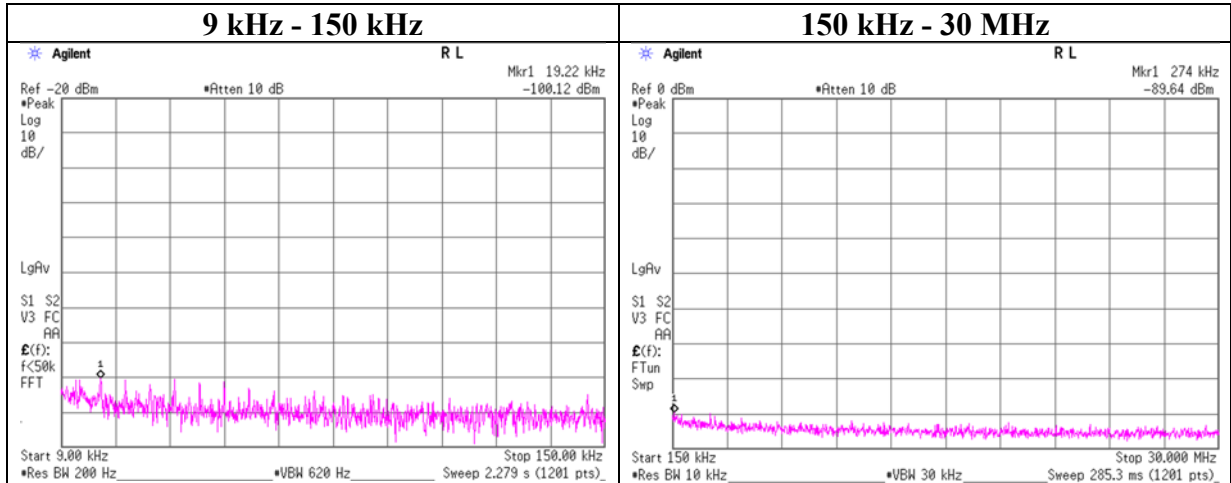
Report No.	12429781S-J-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3			
Date	August 30, 2018	August 27, 2018	August 29, 2018	August 31, 2018
Temperature / Humidity	20 deg. C / 49 % RH	24 deg. C / 56 % RH	21 deg. C / 50 % RH	20 deg. C / 62 % RH
Engineer	Kazutaka Takeyama (30 MHz - 1 GHz)	Makoto Hosaka (1 GHz - 13 GHz)	Kazutaka Takeyama (13 GHz - 18 GHz)	Kazutaka Takeyama (18 GHz - 26.5 GHz)
Mode	Tx BT LE 2412 MHz			



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

Conducted Spurious Emission

Report No. 12429781S-J-R2
 Test place Shonan EMC Lab. No.5 Shielded Room
 Date August 24, 2018
 Temperature / Humidity 26 deg. C / 54 % RH
 Engineer Makoto Hosaka
 Mode Tx 11g 2462 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
19.22	-100.12	0.01	9.5	3.5	1	-87.1	300	6.0	-25.8	41.9	67.7	
274.00	-89.64	0.01	9.5	3.5	1	-76.6	300	6.0	-15.3	18.8	34.1	

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

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

N: Number of output

Power Density

Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 24, 2018
Temperature / Humidity 26 deg. C / 54 % RH
Engineer Makoto Hosaka
Mode Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-22.03	1.91	9.68	-10.44	8.00	18.44
2437.00	-22.25	1.91	9.68	-10.66	8.00	18.66
2462.00	-21.56	1.92	9.67	-9.97	8.00	17.97

11g

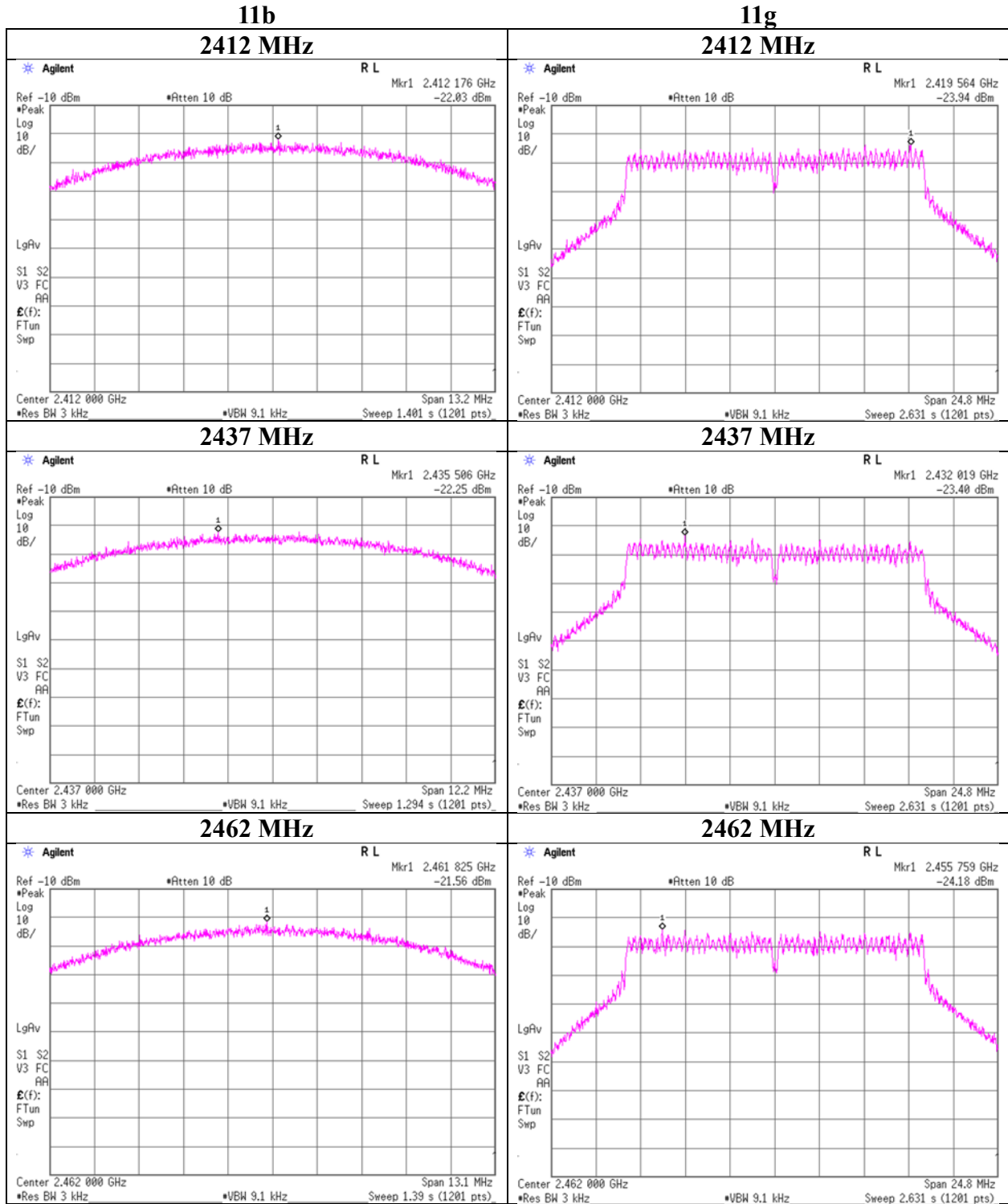
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-23.94	1.91	9.68	-12.35	8.00	20.35
2437.00	-23.40	1.91	9.68	-11.81	8.00	19.81
2462.00	-24.18	1.92	9.67	-12.59	8.00	20.59

Sample Calculation:

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

*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density



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Power Density

Report No. 12429781S-J-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 24, 2018 September 3, 2018
Temperature / Humidity 26 deg. C / 54 % RH 24 deg. C / 57 % RH
Engineer Makoto Hosaka Shiro Kobayashi
Mode Tx 11n-20 Tx BT LE

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-24.02	1.91	9.68	-12.43	8.00	20.43
2437.00	-23.03	1.91	9.68	-11.44	8.00	19.44
2462.00	-23.97	1.92	9.67	-12.38	8.00	20.38

BT LE

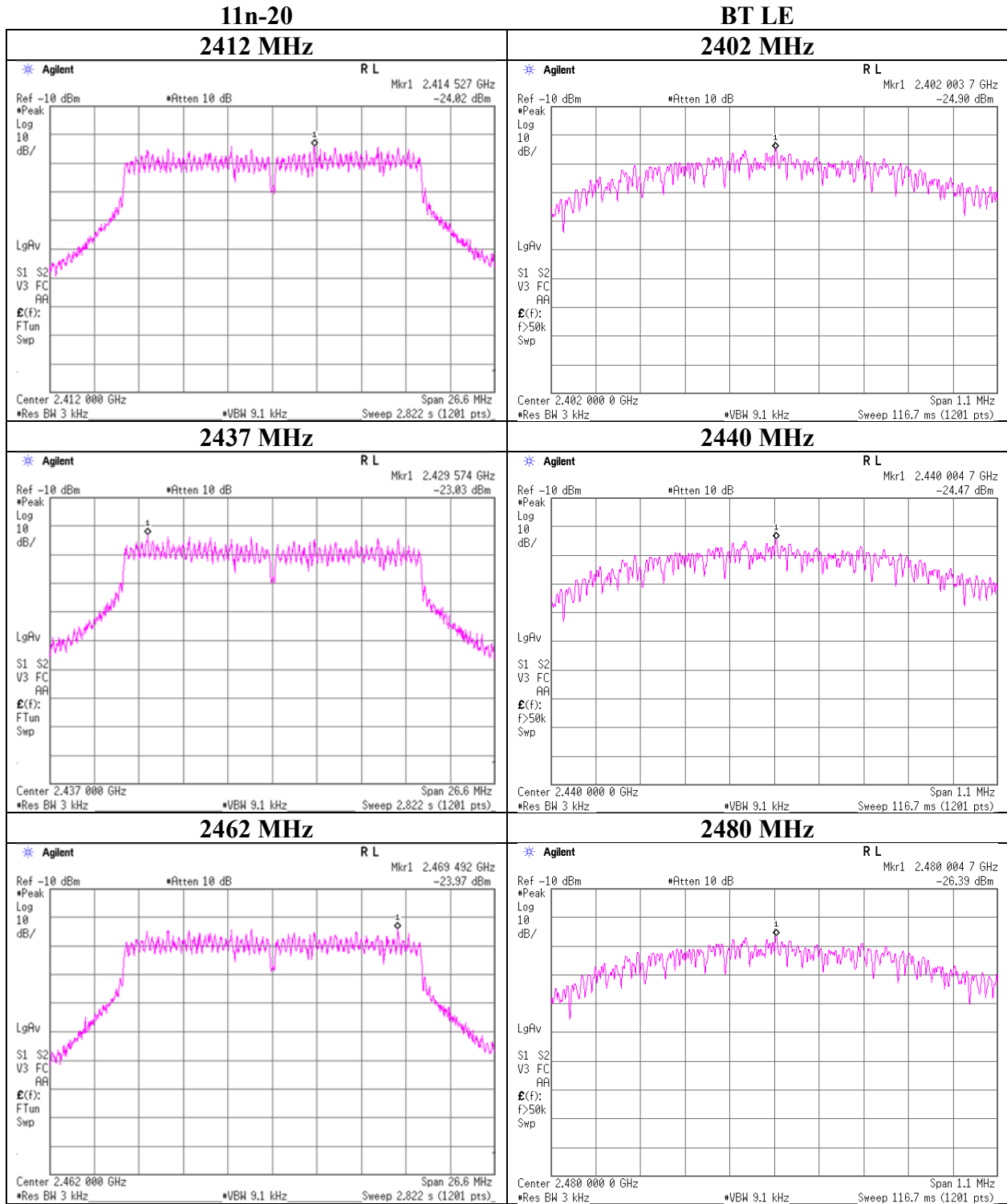
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-24.90	1.90	9.68	-13.32	8.00	21.32
2440.00	-24.47	1.91	9.67	-12.89	8.00	20.89
2480.00	-26.39	1.92	9.67	-14.80	8.00	22.80

Sample Calculation:

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

*The equipment and cables were not used for factor 0 dB of the data sheets.

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APPENDIX 2: Test instruments

Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2018/07/13 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY53260009	AT	2018/07/13 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2017/11/22 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2018/03/19 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2017/10/10 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2017/12/21 * 12
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2018/07/17 * 12
SAJ-01	Antenna Tilt Jig	Intelligent System Engineering Co., Ltd	Antenna Tilt Jig	T-S001	RE	Pre Check
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2018/03/05 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2018/07/23 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000N FSNMS/B	1612S006	RE	2018/01/29 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2018/06/01 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2018/09/14 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2018/05/11 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,C E,RFL,MF)	-	RE,CE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE,CE	2017/10/16 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2018/06/02 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2018/06/17 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2018/06/17 * 12
SAT6-13	Attenuator	JFW	50HF-006N	-	RE	2018/02/09 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2018/04/09 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2018/02/16 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE,CE	2017/11/24 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2018/07/23 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2018/03/27 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2018/03/19 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K MSKMS	-	RE	2018/04/20 * 12
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271(RF Selector)	CE	2018/04/09 * 12
SLS-02	LISN	Rohde & Schwarz	ENV216	100512	CE	2018/02/26 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2018/09/14 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2017/12/21 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2017/12/14 * 12

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

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

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

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

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