



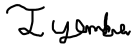
RADIO TEST REPORT

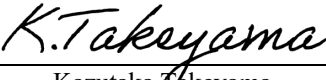
Test Report No. : 13218140S-A-R1

Applicant : PIONEER CORPORATION
Type of EUT : MULTIMEDIA NAVIGATION RECEIVER
Model Number of EUT : AVIC-W8600NEX
FCC ID : AJDK113
Test regulation : FCC Part 15 Subpart C: 2019
*Wireless LAN part
Test Result : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
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. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13218140S-A. 13218140S-A is replaced with this report.

Date of test: January 10 to February 8, 2020

Representative test engineer: 
Toshinori Yamada
Engineer
Consumer Technology Division

Approved by: 
Kazutaka Takeyama
Engineer
Consumer Technology Division



CERTIFICATE 1266.03

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

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REVISION HISTORY

Original Test Report No.: 13218140S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13218140S-A	March 5, 2020	-	-
1	13218140S-A-R1	March 11, 2020	P.5	Modification of Clock frequency(ies) in the system from: LPO clock for Bluetooth Wi-Fi module: 32.768 kHz to: LPO CLOCK GENERATOR for Bluetooth Wi-Fi module: 32.768 kHz
			P.27	Modification of 20 dBc Data Sheet Horizontal Limit from: 76.09 to: 71.57 Vertical Limit from: 79.31 to: 74.79
			P.27, P.29, P.30	Modification of Distance Factor from: 2.28 to: 2.24
			P.32	Modification of 20dBc Sheet Horizontal Limit from: 70.53 to: 66.01 Vertical Limit from: 76.6 to: 72.09
			P.37	Modification of 20dBc Sheet Horizontal Limit from: 70.06 to: 65.54 Vertical Limit from: 75.35 to: 70.83

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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CONTENTS	PAGE
SECTION 1: Customer information.....	5
SECTION 2: Equipment under test (E.U.T.).....	5
SECTION 3: Test specification, procedures & results.....	7
SECTION 4: Operation of E.U.T. during testing.....	10
SECTION 5: Radiated Spurious Emission	13
SECTION 6: Antenna Terminal Conducted Tests.....	15
APPENDIX 1: Test data	16
6 dB Bandwidth and 99 % Occupied Bandwidth.....	16
Maximum Peak Output Power.....	21
Average Output Power.....	24
Radiated Spurious Emission	27
Conducted Spurious Emission	43
Power Density	44
APPENDIX 2: Test instruments	47
APPENDIX 3: Photographs of test setup	49
Radiated Spurious Emission	49

SECTION 1: Customer information

Company Name	:	PIONEER CORPORATION
Address	:	25-1, Yamada, Kawagoe-shi, Saitama, 350-8555, JAPAN
Telephone Number	:	+81-49-228-7681
Facsimile Number	:	+81-49-228-6172
Contact Person	:	Shigeru Yoshida

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
 - Operating/Test Mode(s) (Mode(s)) on all the relevant pages
 - SECTION 1: Customer information
 - SECTION 2: Equipment under test (E.U.T.)
 - SECTION 4: Operation of E.U.T. during testing
- * The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	MULTIMEDIA NAVIGATION RECEIVER
Model No.	:	AVIC-W8600NEX
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 14.4 V (DC 10.8 V to 15.1 V)
Receipt Date of Sample (Information from test lab.)	:	December 27, 2019
Country of Mass-production	:	Thailand
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: AVIC-W8600NEX (referred to as the EUT in this report) is a MULTIMEDIA NAVIGATION RECEIVER.

General Specification

Clock frequency(ies) in the system	:	LPO CLOCK GENERATOR for Bluetooth Wi-Fi module: 32.768 kHz DC-DC CONVERTER: 1000 kHz/ 700.5 kHz/ 2.29 MHz/ 2.17 MHz/ 767.25 kHz/ 699.05 kHz/ 767.25 kHz/ 699.05 kHz/ 436.907 kHz/ 383.625 kHz/ 436.907 kHz/ 383.625 kHz FM/AM TUNER: 9.216 MHz (VCO: 5.9904 GHz/ 6.2208 GHz) TMC TUNER: 9.216 MHz (VCO: 5.9904 GHz/ 6.2208 GHz) MAIN PROCESSOR: 24 MHz/ 32.768 kHz/ 11.2896 MHz SYSTEM MICRO COMPUTER: 3.93216 MHz DVD DRIVER: 27 MHz/ 121.5 MHz/ 36.864 MHz/ 33.8688 MHz LCD BACK LIGHT: 436.907 kHz/ 383.625 kHz ELECTRONIC VOLUME: 18.432 MHz FPGA: 14.7456 MHz ECHO CANCELLER: 12.288 MHz HDMI RECEIVER: 27 MHz DISPLAY CONTROLLER: 32 MHz VIDEO DECODER: 32 MHz MICRO COMPUTER: 10 MHz WWR UNIT: 24 MHz GPS: 26 MHz
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Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2.4 GHz: 2402 MHz - 2480 MHz (Bluetooth BR/EDR) 2412 MHz - 2462 MHz (IEEE 802.11b/g/n) U-NII-3: 5745 MHz - 5825 MHz (IEEE 802.11a/n-20) 5755 MHz - 5795 MHz (IEEE 802.11n/ac-40) 5775 MHz (IEEE 802.11ac-80)
Modulation	:	DSSS (IEEE 802.11b), OFDM (IEEE 802.11g/n/a/ac) FHSS (Bluetooth BR/EDR)
Power Supply (inner)	:	DC 3.3 V/1.8 V
Antenna type	:	Monopole Antenna
Antenna Gain	:	2.4 GHz: -8.0 dBi (Bluetooth BR/EDR) -4.7 dBi (IEEE 802.11b/g/n) 5 GHz: -3.0 dBi
Operating Temperature	:	-10 deg. C to +60 deg. C
Information of the Factory		
Factory Name	:	PIONEER MANUFACTURING (THAILAND) CO., LTD.
Address	:	Rojana Industrial Park, 1/31 Moo 5 Tambol Kanham Amphur U-Thai Pranakornsriyutthaya 13210, Thailand

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz,
and 5725-5850 MHz

*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 ISED: RSS-Gen 8.8	FCC: Section 15.207 ----- ISED: RSS-Gen 8.8	N/A	N/A	*1)
6dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(2) ----- ISED: RSS-247 5.2(a)	See data.	Complied a)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ----- ISED: RSS-247 5.4(d)		Complied b)	Conducted
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(e) ----- ISED: RSS-247 5.2(b)		Complied c)	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ----- ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.1 dB 9848.00 MHz, AV, Hori. Mode: Tx 11n-20 2462 MHz	Complied# d), e)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The test is not applicable since the EUT does not have AC power ports.

*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)

b) Refer to APPENDIX 1 (data of Maximum Peak Output Power)

c) Refer to APPENDIX 1 (data of Power Density)

d) Refer to APPENDIX 1 (data of Conducted Spurious Emission)

e) 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 the wireless transmitter regardless of input voltage.

Instead of a new battery, DC power supply was used for the test. That does not affect the test result, 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.

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3.3 Addition to standard

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

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 results are derived depending on whether or not laboratory uncertainty is applied.

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

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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 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	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %
Temperature	0.95 deg.C.
Voltage	0.83 %

3.5 Test Location

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A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	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.

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

4.1 Operating Mode(s)

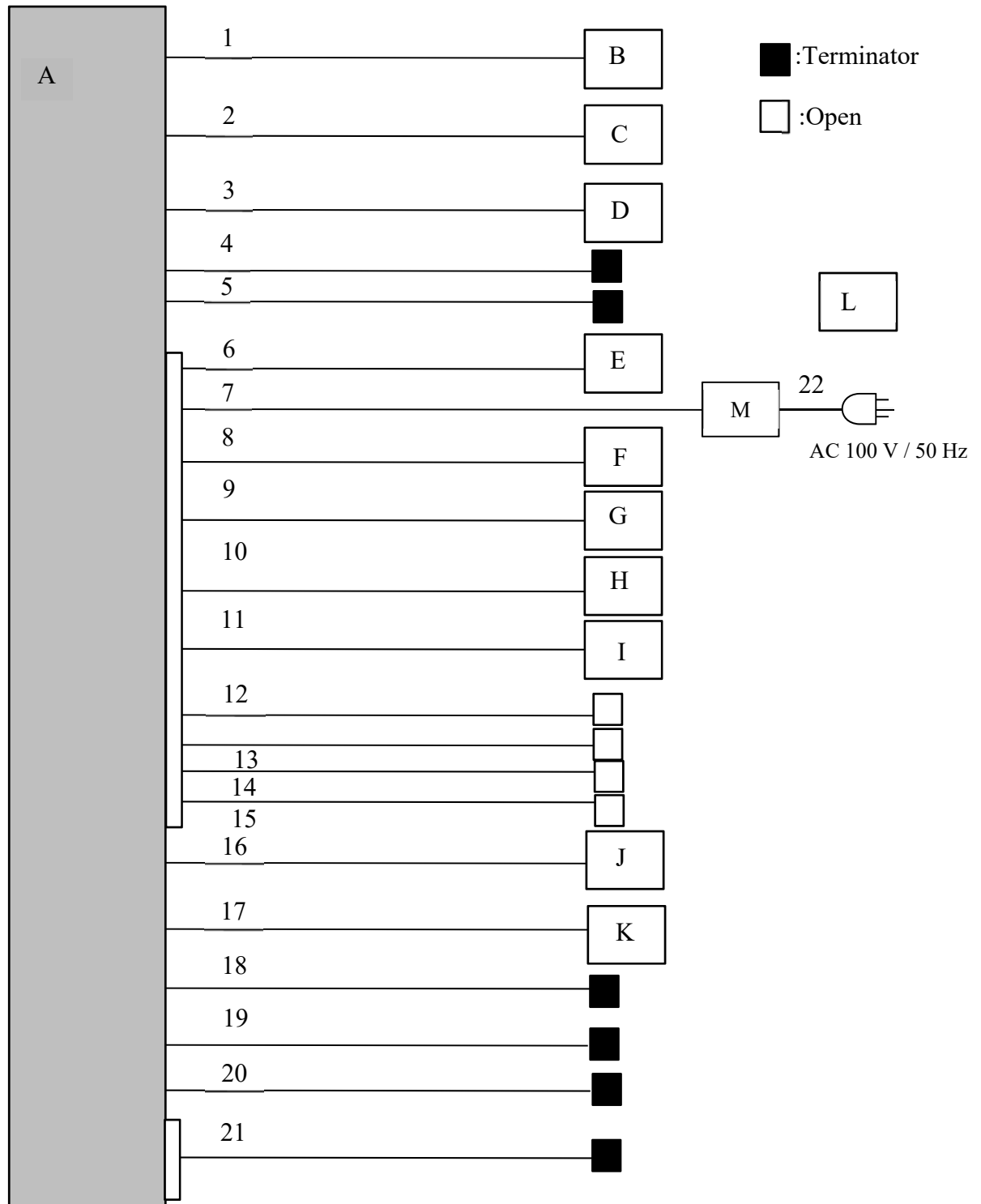
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	48 Mbps, PN9
IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 5 (Short GI OFF), PN9
*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: 14 dBm 11g: 12 dBm 11n-20: 11 dBm Software: SoC: Ver 1.000300 SYS: Ver 8.01 (Date: 2020.1.10 Storage location: EUT memory) Windows 7 Tera Term Version 4.98 (Date: 2020.1.10 Storage location: Driven by connected PC) *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
Spurious Emission	11b Tx	2412 MHz
	11g Tx	2437 MHz
	11n-20 Tx	2462 MHz
6dB Bandwidth	11b Tx	2412 MHz
Maximum Peak Output Power	11g Tx	2437 MHz
Power Density	11n-20 Tx	2462 MHz
99% Occupied Bandwidth		

4.2 Configuration and peripherals



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

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	MULTIMEDIA NAVIGATION RECEIVER	AVIC-W8600NEX	RFTM005855UC*1) RFTM004939UC*2)	Pioneer	EUT
B	GPS Antenna	-	-	-	-
C	USB Memory	SDK-USMGL(B)	-	SONY	-
D	USB Memory	SDK-USMGL(B)	-	SONY	-
E	Mic	-	-	-	-
F	Speaker	LV-002	-	L&V	-
G	Speaker	LV-002	-	L&V	-
H	Speaker	LV-002	-	L&V	-
I	Speaker	LV-002	-	L&V	-
J	Smartphone	SO-01C	-	Sony Ericsson	-
K	Vehicle Tuner	SXV200	-	SiriusXM	-
L	Remote control unit	CD-R33	-	Pioneer	-
M	Power Supply	PAN35-10A	ML002085	KIKUSUI	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	GPS Antenna	3.5	Shielded	Shielded	-
2	USB	1.5	Shielded	Shielded	-
3	USB	1.5	Shielded	Shielded	-
4	W/R	1.7	Shielded	Shielded	-
5	R. Audio Out	2.0	Shielded	Shielded	-
6	Mic	2.8	Unshielded	Unshielded	-
7	DC	0.4 + 2.3	Unshielded	Unshielded	-
8	Speaker	0.2 + 3.6	Unshielded	Unshielded	-
9	Speaker	0.2 + 3.6	Unshielded	Unshielded	-
10	Speaker	0.2 + 3.6	Unshielded	Unshielded	-
11	Speaker	0.2 + 3.6	Unshielded	Unshielded	-
12	Parking	2.0	Unshielded	Unshielded	-
13	REVERSE GEAR SIGNAL INPUT	0.2 + 1.0	Unshielded	Unshielded	-
14	SYSTEM REMOTE CONTROL	0.2 + 1.0	Unshielded	Unshielded	-
15	CAR SPEED SIGNAL INPUT	0.2 + 1.0	Unshielded	Unshielded	-
16	HDMI	2.0	Shielded	Shielded	-
17	Vehicle Tuner	0.65	Shielded	Shielded	-
18	FM Antenna	2.0	Shielded	Shielded	-
19	RGB Cable	2.0	Shielded	Shielded	Terminated
20	iDATA	1.0	Unshielded	Unshielded	-
21	AV input	1.6	Unshielded	Unshielded	24 pin
22	AC	1.0	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

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

[For above 1 GHz]

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

The height of the measuring antenna varied between 1 m 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(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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	<u>11.12.2.5.1</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces <u>11.12.2.5.2</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

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

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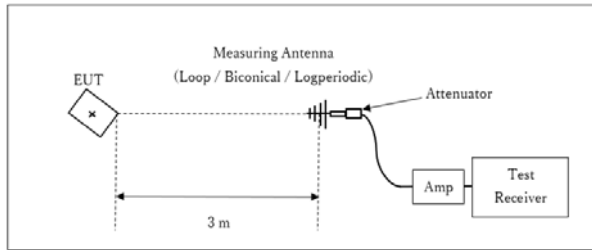
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Facsimile : +81 463 50 6401

Figure 2: Test Setup

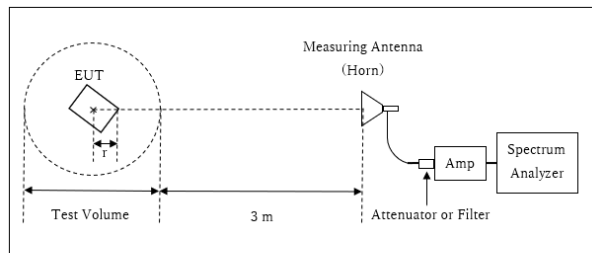
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor: $20 \times \log (3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$

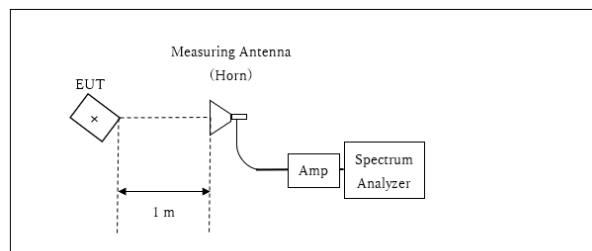
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.88 \text{ m}$

Test Volume : 2.0 m

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

$r = 0.12 \text{ m}$

13 GHz – 26.5 GHz



x : 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

- The carrier level and noise levels were confirmed at angle of 0 to 30 deg. Based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz – 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)
Horizontal	30 deg	0 deg	30 deg	0 deg	0 deg	0 deg
Vertical	0 deg	0 deg	0 deg	0 deg	0 deg	0 deg

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

Measurement range : 30 MHz - 26.5 GHz

Test data : APPENDIX

Test result : Pass

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SECTION 6: 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	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: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 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	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 not detected as shown in the chart. (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)							

The test results and limit are rounded off to two decimals place, so some differences might be observed.
 The equipment and cables were not used for factor 0 dB of the data sheets.

Test data : APPENDIX
Test result : Pass

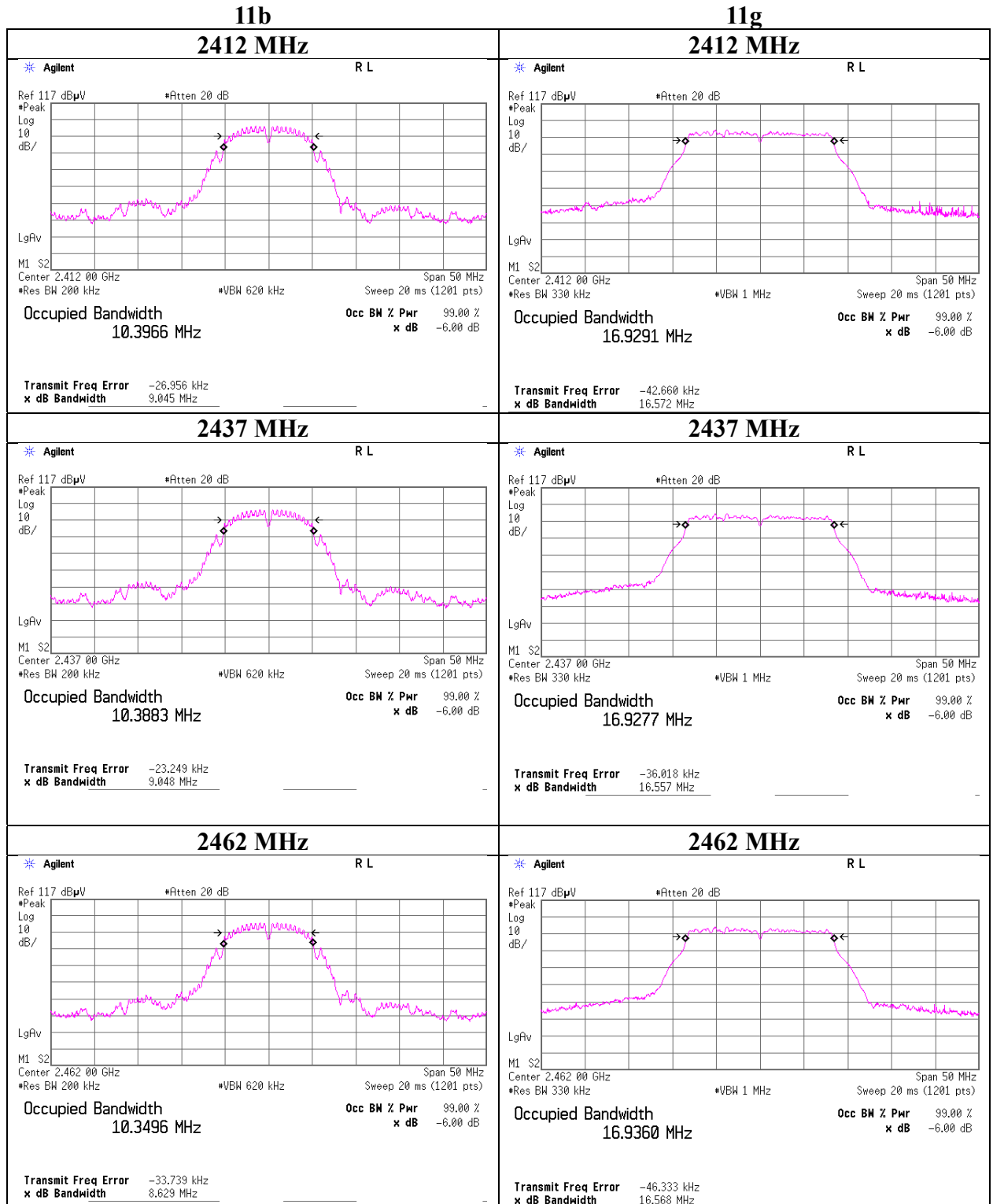
APPENDIX 1: Test data

6 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date February 8, 2020
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Makoto Hosaka
Mode Tx

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	10396.6	8.586	> 0.5000
	2437	10388.3	8.582	> 0.5000
	2462	10349.6	8.585	> 0.5000
11g	2412	16929.1	16.474	> 0.5000
	2437	16927.7	16.471	> 0.5000
	2462	16936.0	16.472	> 0.5000
11n-20	2412	18070.0	17.782	> 0.5000
	2437	18092.6	17.783	> 0.5000
	2462	18081.2	17.778	> 0.5000

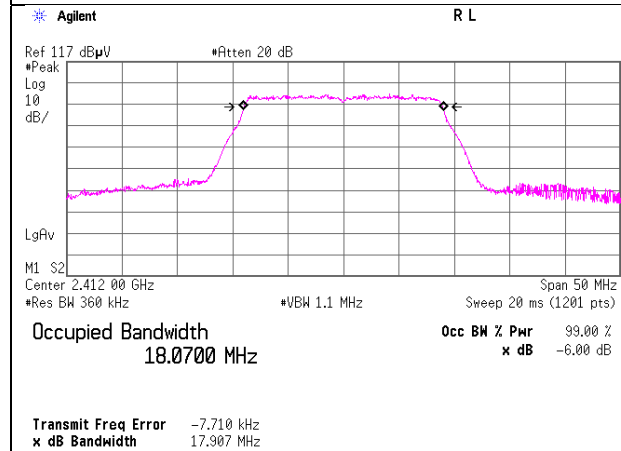
99%Occupied Bandwidth



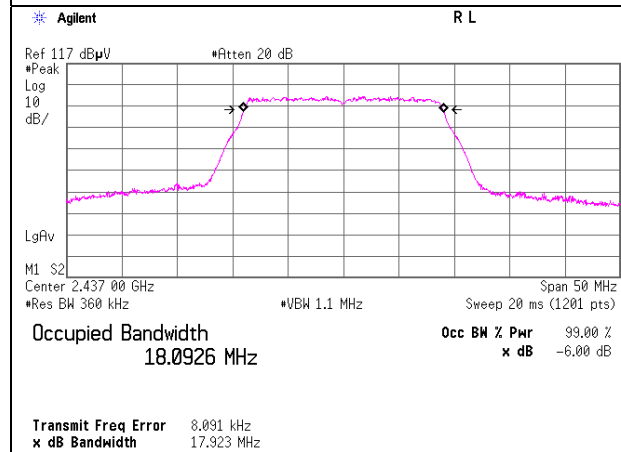
99% Occupied Bandwidth

11n-20

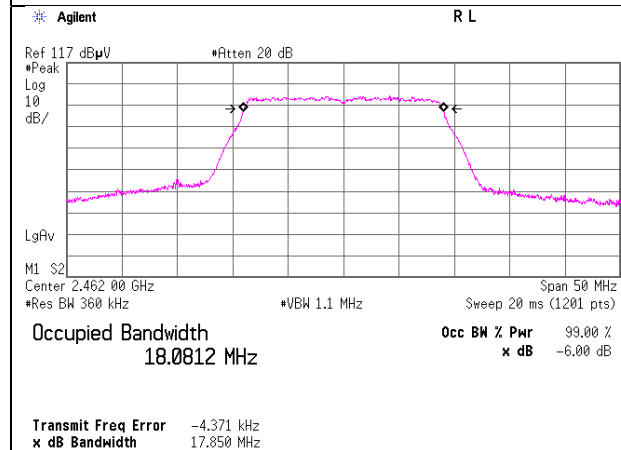
2412 MHz



2437 MHz



2462 MHz



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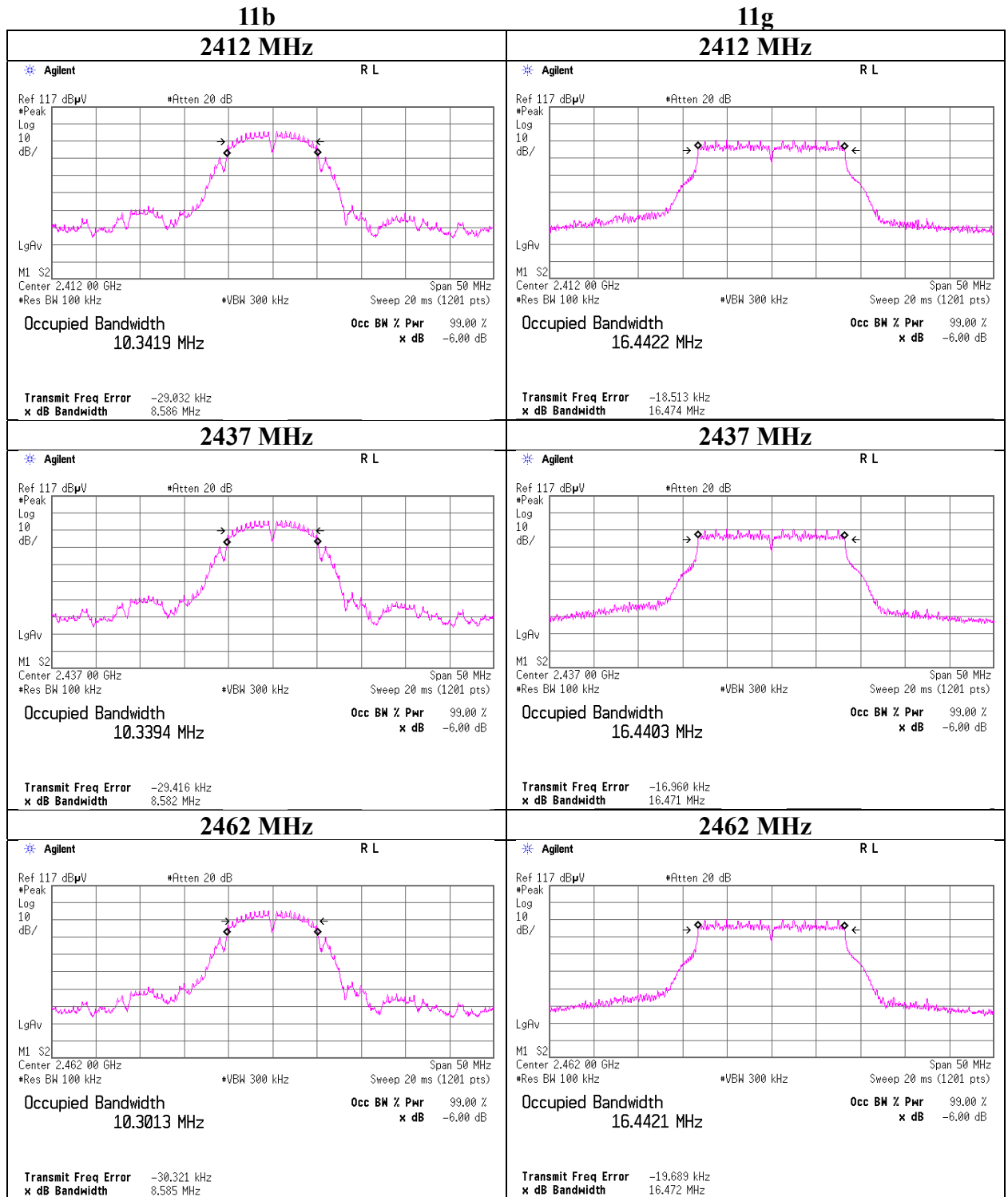
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6dB Bandwidth



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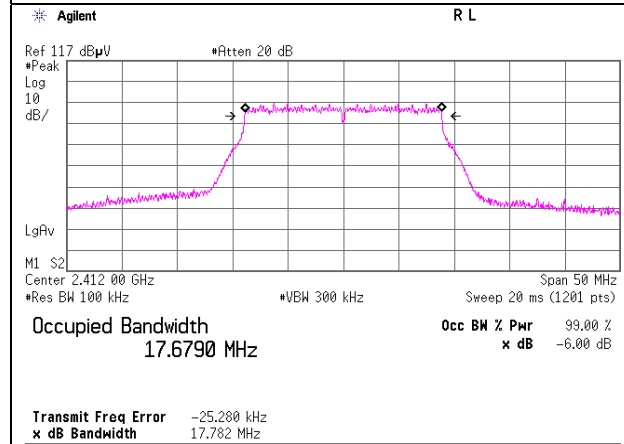
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

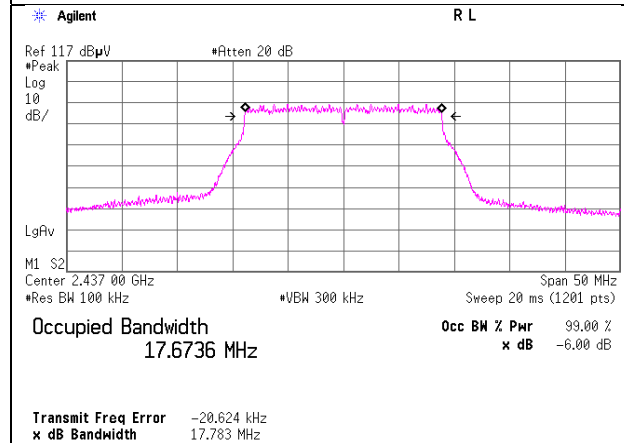
6dB Bandwidth

11n-20

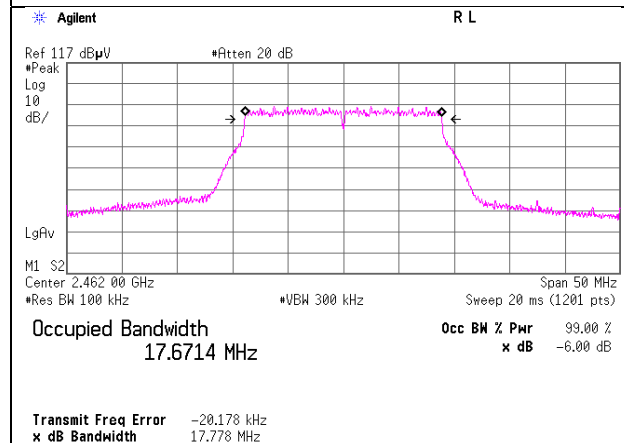
2412 MHz



2437 MHz



2462 MHz



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Maximum Peak Output Power

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.2 Shielded Room
Date January 10, 2020 January 20, 2020
Temperature / Humidity 23 deg. C / 35 % RH 22 deg. C / 47 % RH
Engineer Yusuke Tanikawara Toshinori Yamada
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	-2.32	1.64	20.20	19.52	89.54	30.00	1000	10.48	-4.70	14.82	30.34	36.02	4000	21.20	
2437	-2.38	1.64	20.20	19.46	88.31	30.00	1000	10.54	-4.70	14.76	29.92	36.02	4000	21.26	
2462	-2.62	1.65	20.20	19.23	83.75	30.00	1000	10.77	-4.70	14.53	28.38	36.02	4000	21.49	

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.

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	-2.38	*
2	-2.68	
5.5	-2.87	
11	-2.55	

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.2 Shielded Room
Date January 10, 2020
Temperature / Humidity 23 deg. C / 35 % RH
Engineer Yusuke Tanikawara
Mode Tx 11g

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	2.29	1.64	20.20	24.13	258.82	30.00	1000	5.87	-4.70	19.43	87.70	36.02	4000	16.59
2437	2.53	1.64	20.20	24.37	273.53	30.00	1000	5.63	-4.70	19.67	92.68	36.02	4000	16.35
2462	2.01	1.65	20.20	23.86	243.22	30.00	1000	6.14	-4.70	19.16	82.41	36.02	4000	16.86

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	1.35	
9	1.17	
12	1.01	
18	1.15	
24	1.41	
36	2.41	
48	2.53	*
54	1.00	

*: Worst Rate

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

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Maximum Peak Output Power

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.2 Shielded Room
Date January 10, 2020
Temperature / Humidity 23 deg. C / 35 % RH
Engineer Yusuke Tanikawara
Mode Tx 11n-20

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	2.67	1.64	20.20	24.51	282.49	30.00	1000	5.49	-4.70	19.81	95.72	36.02	4000	16.21
2437	2.54	1.64	20.20	24.38	274.16	30.00	1000	5.62	-4.70	19.68	92.90	36.02	4000	16.34
2462	2.42	1.65	20.20	24.27	267.30	30.00	1000	5.73	-4.70	19.57	90.57	36.02	4000	16.45

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 (SGI OFF)

Rate	Reading	Remark
[Mbps]	[dBm]	
0	1.41	
1	1.69	
2	1.51	
3	1.83	
4	2.13	
5	2.54	*
6	1.71	
7	1.95	

2437 MHz (SGI ON)

Rate	Reading	Remark
[Mbps]	[dBm]	
0	1.12	
1	1.69	
2	1.25	
3	1.92	
4	1.84	
5	2.23	
6	1.81	
7	1.40	

*: Worst Rate

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

Average Output Power
(Reference data for RF Exposure)

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.2 Shielded Room
Date January 10, 2020 January 20, 2020
Temperature / Humidity 23 deg. C / 35 % RH 22 deg. C / 47 % RH
Engineer Yusuke Tanikawara Toshinori Yamada
Mode Tx

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	-6.31	1.64	20.20	15.53	35.73	0.04	15.57	36.06
2437	-6.39	1.64	20.20	15.45	35.08	0.04	15.49	35.40
2462	-6.64	1.65	20.20	15.21	33.19	0.04	15.25	33.50

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	-8.62	1.64	20.20	13.22	20.99	0.29	13.51	22.44
2437	-8.69	1.64	20.20	13.15	20.65	0.29	13.44	22.08
2462	-8.88	1.65	20.20	12.97	19.82	0.29	13.26	21.18

11n-20 MCS 0 (SGI OFF)

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	-9.78	1.64	20.20	12.06	16.07	0.31	12.37	17.26
2437	-9.84	1.64	20.20	12.00	15.85	0.31	12.31	17.02
2462	-10.01	1.65	20.20	11.84	15.28	0.31	12.15	16.41

Sample Calculation:

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

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

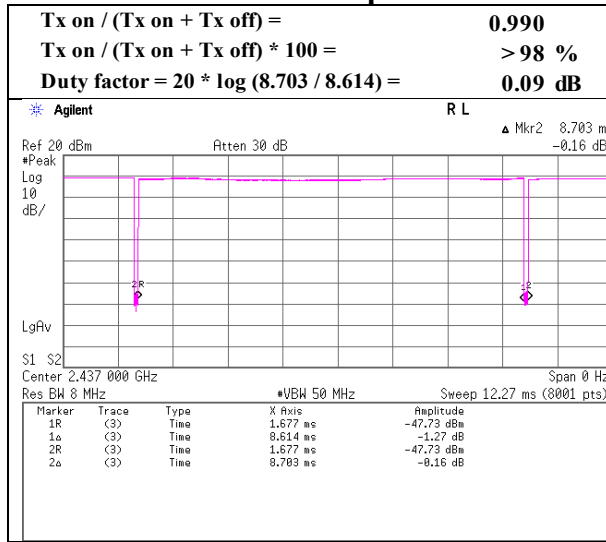
*The equipment and cables were not used for factor 0 dB of the data sheets.

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.

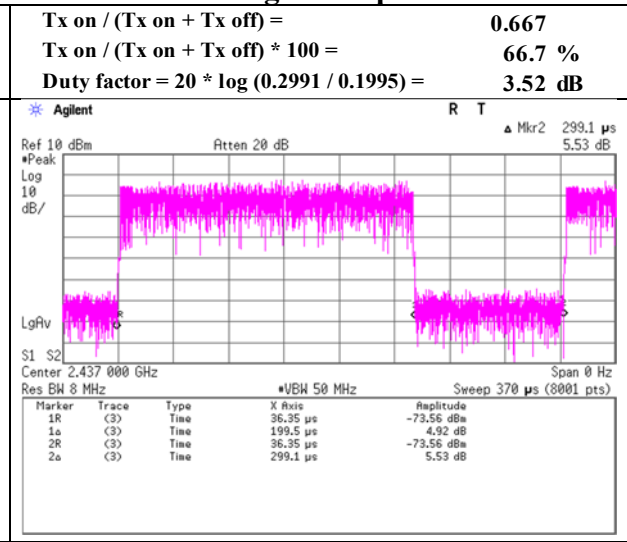
Burst rate confirmation (Reference data for Radiated Spurious Emission)

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.3 Shielded Room
Date January 12, 2020
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Toshinori Yamada
Mode Tx

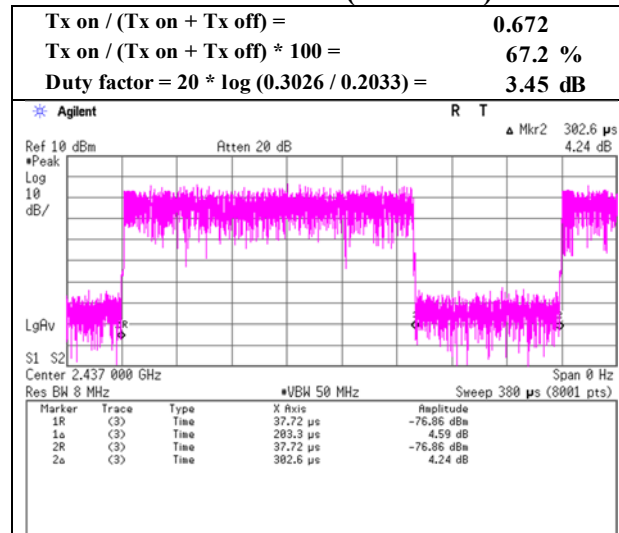
11b 1 Mbps



11g 48 Mbps



11n-20 MCS 5(SGI OFF)



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

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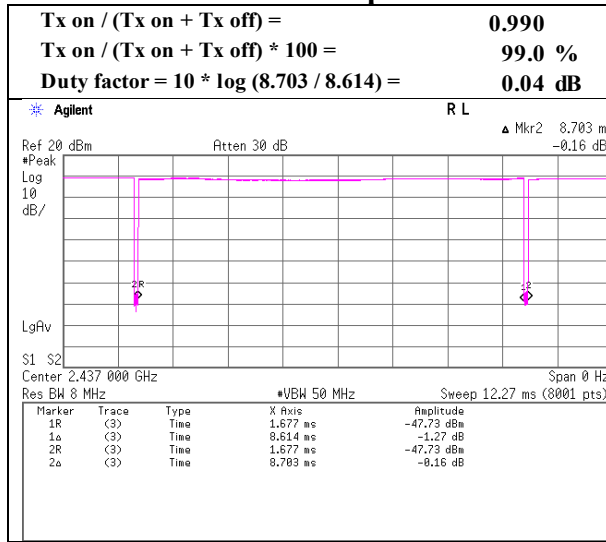
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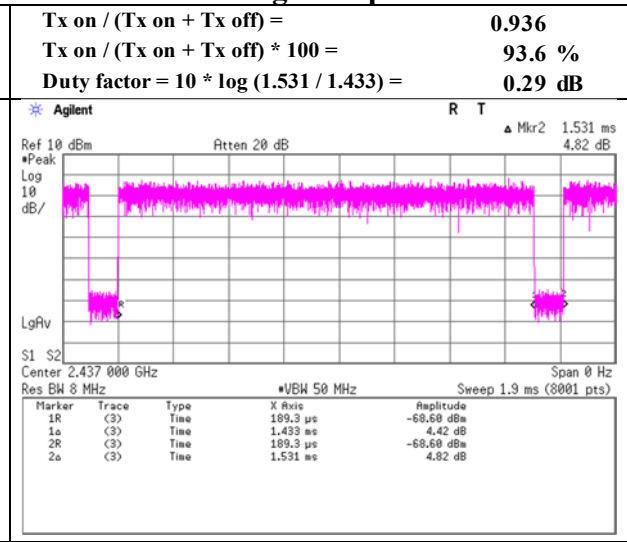
Burst rate confirmation (Reference data for Average output power)

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.3 Shielded Room
Date January 12, 2020
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Toshinori Yamada
Mode Tx

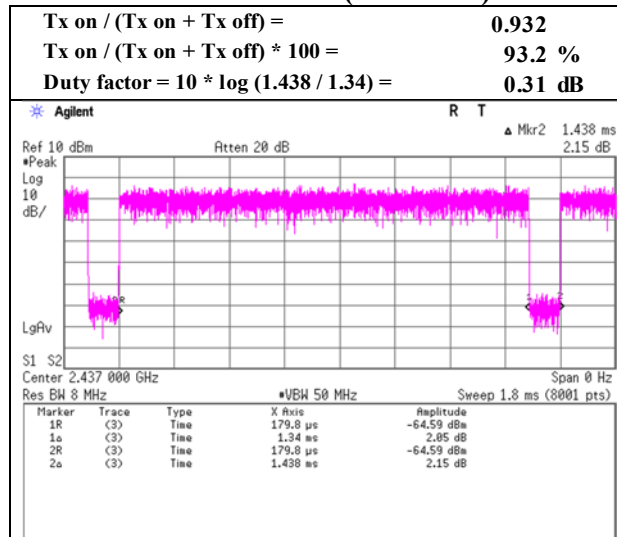
11b 1 Mbps



11g 6 Mbps



11n-20 MCS 0(SGI OFF)



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

Radiated Spurious Emission

Report No.	13218140S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 20, 2019	January 14, 2019
Temperature / Humidity	22 deg. C / 45 % RH	20 deg. C / 42 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(1 GHz – 13 GHz)	(13 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	48.21	28.33	14.07	41.59	2.24	51.26	73.90	22.6	146	358	
Hori.	4824.000	PK	48.23	31.64	6.59	42.88	2.24	45.82	73.90	28.1	150	0	
Hori.	7236.000	PK	48.32	37.25	8.09	42.98	2.24	52.92	73.90	21.0	150	0	
Hori.	9648.000	PK	48.71	38.97	9.25	43.13	2.24	56.04	73.90	17.9	150	0	
Hori.	2390.000	AV	38.20	28.33	14.07	41.59	2.24	41.25	53.90	12.7	146	358	
Hori.	4824.000	AV	38.78	31.64	6.59	42.88	2.24	36.37	53.90	17.5	150	0	
Hori.	7236.000	AV	39.63	37.25	8.09	42.98	2.24	44.23	53.90	9.7	150	0	
Hori.	9648.000	AV	38.85	38.97	9.25	43.13	2.24	46.18	53.90	7.7	150	0	
Vert.	2390.000	PK	47.56	28.33	14.07	41.59	2.24	50.61	73.90	23.3	153	121	
Vert.	4824.000	PK	48.40	31.64	6.59	42.88	2.24	45.99	73.90	27.9	150	0	
Vert.	7236.000	PK	47.46	37.25	8.09	42.98	2.24	52.06	73.90	21.8	150	0	
Vert.	9648.000	PK	48.62	38.97	9.25	43.13	2.24	55.95	73.90	18.0	150	0	
Vert.	2390.000	AV	39.59	28.33	14.07	41.59	2.24	42.64	53.90	11.3	153	121	
Vert.	4824.000	AV	38.72	31.64	6.59	42.88	2.24	36.31	53.90	17.6	150	0	
Vert.	7236.000	AV	39.11	37.25	8.09	42.98	2.24	43.71	53.90	10.2	150	0	
Vert.	9648.000	AV	38.33	38.97	9.25	43.13	2.24	45.66	53.90	8.2	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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	88.56	28.29	14.08	41.60	2.24	91.57	-	-	Carrier
Hori.	2398.467	PK	43.68	28.31	14.07	41.60	2.24	46.70	71.57	24.9	
Hori.	2400.000	PK	41.27	28.31	14.07	41.60	2.24	44.29	71.57	27.3	
Vert.	2412.000	PK	91.78	28.29	14.08	41.60	2.24	94.79	-	-	Carrier
Vert.	2398.240	PK	45.55	28.31	14.07	41.60	2.24	48.57	74.79	26.2	
Vert.	2400.000	PK	41.36	28.31	14.07	41.60	2.24	44.38	74.79	30.4	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

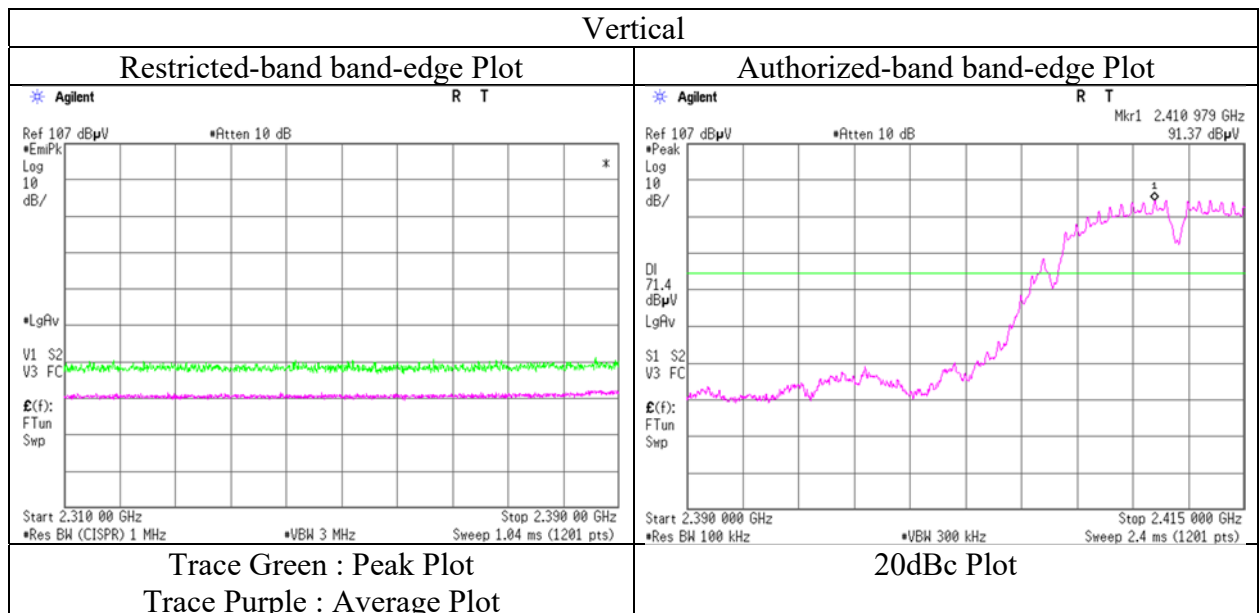
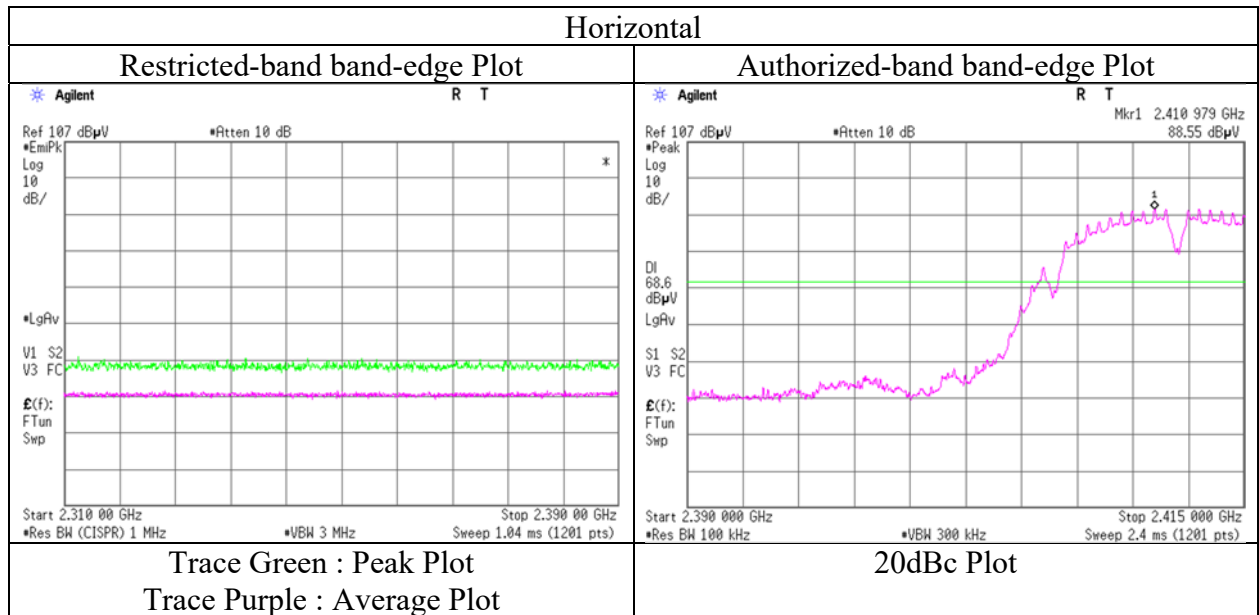
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13218140S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 20, 2019
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx 11b 2412 MHz



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

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

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Shonan EMC Lab.

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Radiated Spurious Emission

Report No.	13218140S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 20, 2019	January 14, 2019
Temperature / Humidity	22 deg. C / 45 % RH	20 deg. C / 42 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(1 GHz – 13 GHz)	(13 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	47.68	31.70	6.62	42.89	2.24	45.35	73.90	28.6	150	0	
Hori.	7311.000	PK	47.81	37.36	8.13	43.13	2.24	52.41	73.90	21.5	150	0	
Hori.	9748.000	PK	48.13	39.31	9.30	43.02	2.24	55.96	73.90	17.9	150	0	
Hori.	4874.000	AV	39.02	31.70	6.62	42.89	2.24	36.69	53.90	17.2	150	0	
Hori.	7311.000	AV	38.87	37.36	8.13	43.13	2.24	43.47	53.90	10.4	150	0	
Hori.	9748.000	AV	38.86	39.31	9.30	43.02	2.24	46.69	53.90	7.2	150	0	
Vert.	4874.000	PK	48.23	31.70	6.62	42.89	2.24	45.90	73.90	28.0	150	0	
Vert.	7311.000	PK	47.87	37.36	8.13	43.13	2.24	52.47	73.90	21.4	150	0	
Vert.	9748.000	PK	47.76	39.31	9.30	43.02	2.24	55.59	73.90	18.3	150	0	
Vert.	4874.000	AV	38.64	31.70	6.62	42.89	2.24	36.31	53.90	17.6	150	0	
Vert.	7311.000	AV	38.82	37.36	8.13	43.13	2.24	43.42	53.90	10.5	150	0	
Vert.	9748.000	AV	38.83	39.31	9.30	43.02	2.24	46.66	53.90	7.2	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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.

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Radiated Spurious Emission

Report No.	13218140S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 20, 2019	January 14, 2019
Temperature / Humidity	22 deg. C / 45 % RH	20 deg. C / 42 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(1 GHz – 13 GHz)	(13 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	48.53	28.24	14.16	41.62	2.24	51.55	73.90	22.4	239	320	
Hori.	4924.000	PK	48.38	31.82	6.64	42.90	2.24	46.18	73.90	27.7	150	0	
Hori.	7386.000	PK	48.73	37.49	8.18	43.28	2.24	53.36	73.90	20.5	150	0	
Hori.	9848.000	PK	48.68	39.33	9.36	42.92	2.24	56.69	73.90	17.2	150	0	
Hori.	2483.500	AV	39.47	28.24	14.16	41.62	2.24	42.49	53.90	11.4	239	320	
Hori.	4924.000	AV	38.86	31.82	6.64	42.90	2.24	36.66	53.90	17.2	150	0	
Hori.	7386.000	AV	39.23	37.49	8.18	43.28	2.24	43.86	53.90	10.0	150	0	
Hori.	9848.000	AV	39.32	39.33	9.36	42.92	2.24	47.33	53.90	6.6	150	0	
Vert.	2483.500	PK	49.65	28.24	14.16	41.62	2.24	52.67	73.90	21.2	104	59	
Vert.	4924.000	PK	48.63	31.82	6.64	42.90	2.24	46.43	73.90	27.5	150	0	
Vert.	7386.000	PK	48.63	37.49	8.18	43.28	2.24	53.26	73.90	20.6	150	0	
Vert.	9848.000	PK	48.73	39.33	9.36	42.92	2.24	56.74	73.90	17.2	150	0	
Vert.	2483.500	AV	40.45	28.24	14.16	41.62	2.24	43.47	53.90	10.4	104	59	
Vert.	4924.000	AV	38.96	31.82	6.64	42.90	2.24	36.76	53.90	17.1	150	0	
Vert.	7386.000	AV	39.11	37.49	8.18	43.28	2.24	43.74	53.90	10.2	150	0	
Vert.	9848.000	AV	39.45	39.33	9.36	42.92	2.24	47.46	53.90	6.4	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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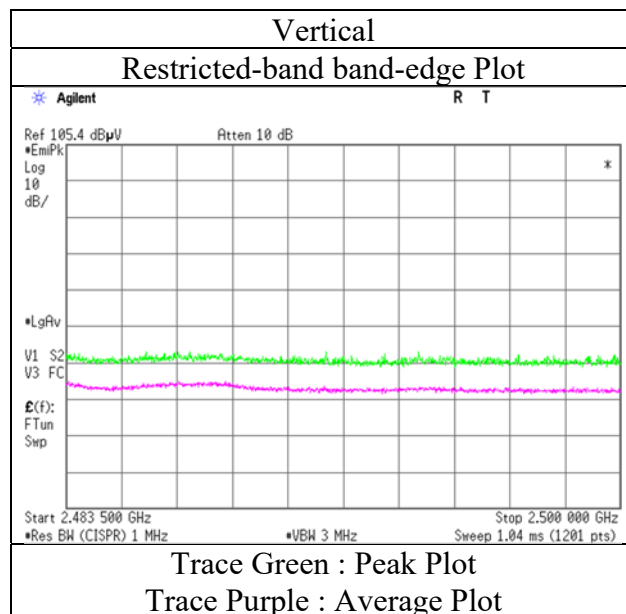
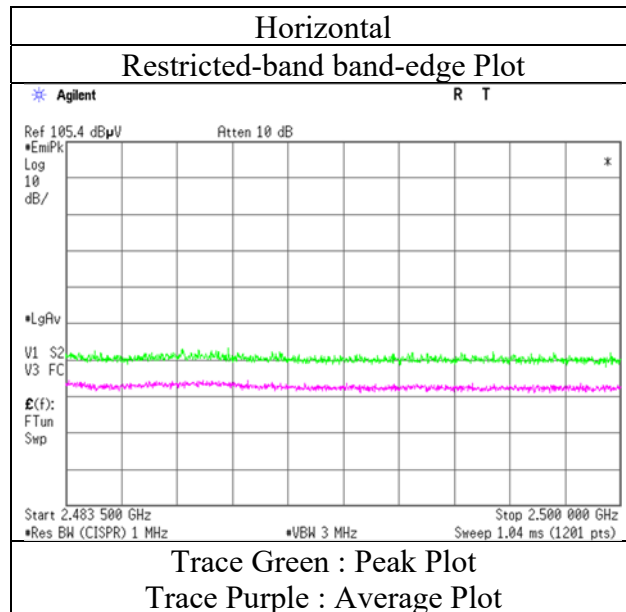
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13218140S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 20, 2019
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx 11b 2462 MHz



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

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

Radiated Spurious Emission

Report No.	13218140S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 11, 2019	January 14, 2019
Temperature / Humidity	20 deg. C / 36 % RH	20 deg. C / 42 % RH
Engineer	Toshinori Yamada	Toshinori Yamada
	(1 GHz – 13 GHz)	(13 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	48.37	28.33	14.07	41.59	2.24	51.42	73.90	22.5	156	44	
Hori.	4824.000	PK	48.63	31.64	6.42	42.88	2.24	46.05	73.90	27.9	150	0	
Hori.	7236.000	PK	48.34	37.25	7.86	42.98	2.24	52.71	73.90	21.2	150	0	
Hori.	9648.000	PK	47.98	38.97	9.04	43.13	2.24	55.10	73.90	18.8	150	0	
Vert.	2390.000	PK	52.83	28.33	14.07	41.59	2.24	55.88	73.90	18.0	100	51	
Vert.	4824.000	PK	48.39	31.64	6.42	42.88	2.24	45.81	73.90	28.1	150	0	
Vert.	7236.000	PK	48.72	37.25	7.86	42.98	2.24	53.09	73.90	20.8	150	0	
Vert.	9648.000	PK	48.21	38.97	9.04	43.13	2.24	55.33	73.90	18.6	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 (3.88 m / 3.0 m) = 2.24 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	38.48	28.33	14.07	41.59	3.52	2.24	45.05	53.9	8.9	*1)
Hori.	4824.000	AV	38.85	31.64	6.42	42.88	3.52	2.24	39.79	53.9	14.1	
Hori.	7236.000	AV	38.97	37.25	7.86	42.98	3.52	2.24	46.86	53.9	7.0	
Hori.	9648.000	AV	38.42	38.97	9.04	43.13	3.52	2.24	49.06	53.9	4.8	
Vert.	2390.000	AV	40.25	28.33	14.07	41.59	3.52	2.24	46.82	53.9	7.1	*1)
Vert.	4824.000	AV	38.89	31.64	6.42	42.88	3.52	2.24	39.83	53.9	14.1	
Vert.	7236.000	AV	39.00	37.25	7.86	42.98	3.52	2.24	46.89	53.9	7.0	
Vert.	9648.000	AV	38.28	38.97	9.04	43.13	3.52	2.24	48.92	53.9	5.0	

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 (3.88 m / 3.0 m) = 2.24 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	83.00	28.29	14.08	41.60	2.24	86.01	-	-	Carrier
Hori.	2399.217	PK	43.62	28.31	14.07	41.60	2.24	46.64	66.01	19.4	
Hori.	2400.000	PK	42.33	28.31	14.07	41.60	2.24	45.35	66.01	20.7	
Vert.	2412.000	PK	89.08	28.29	14.08	41.60	2.24	92.09	-	-	Carrier
Vert.	2398.542	PK	46.77	28.31	14.07	41.60	2.24	49.79	72.09	22.3	
Vert.	2400.000	PK	46.87	28.31	14.07	41.60	2.24	49.89	72.09	22.2	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

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

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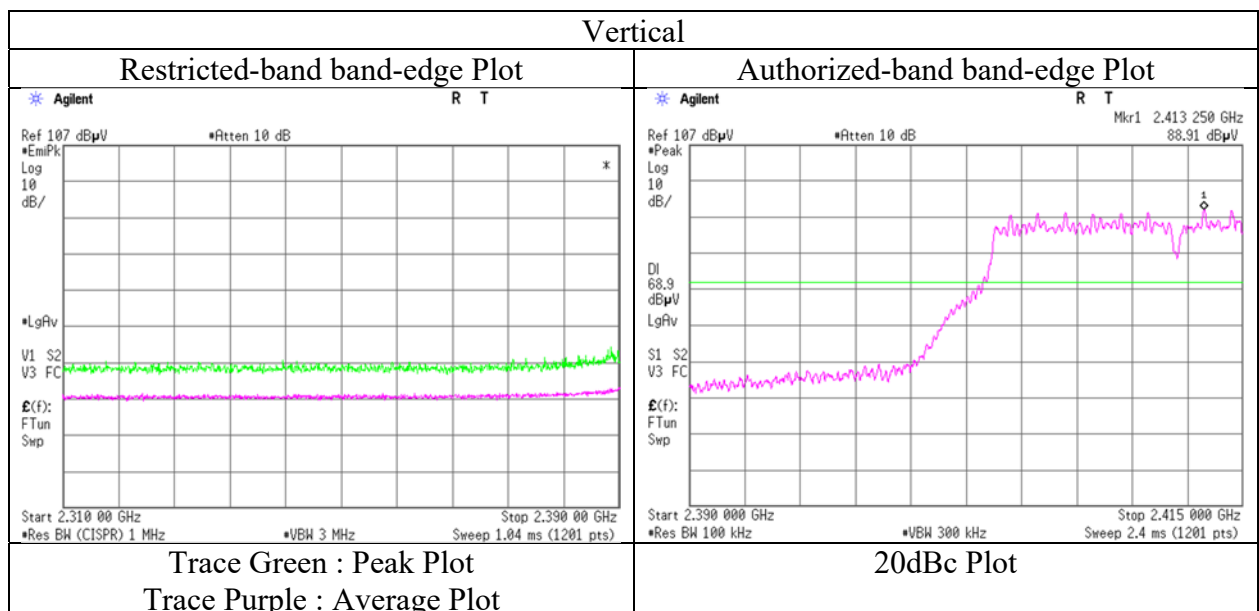
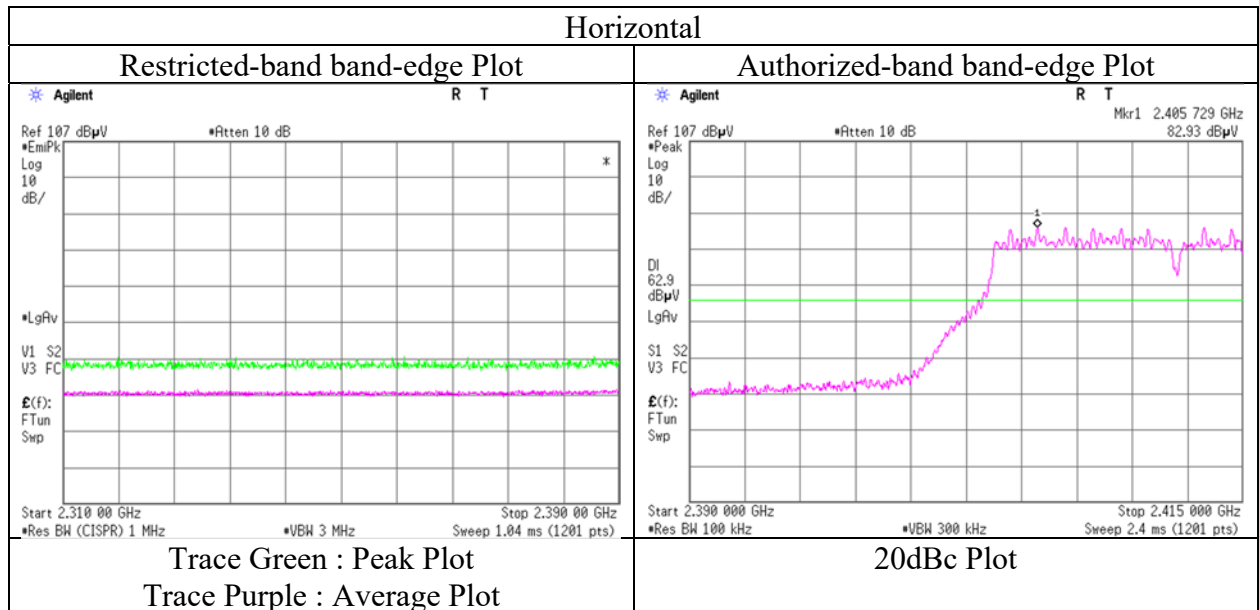
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13218140S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 20, 2019
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx 11g 2412 MHz



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

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

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Radiated Spurious Emission

Report No.	13218140S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 11, 2019	January 14, 2019
Temperature / Humidity	20 deg. C / 36 % RH	20 deg. C / 42 % RH
Engineer	Toshinori Yamada	Toshinori Yamada
	(1 GHz – 13 GHz)	(13 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	48.65	31.70	6.45	42.89	2.24	46.15	73.90	27.8	150	0	
Hori.	7311.000	PK	48.27	37.36	7.90	43.13	2.24	52.64	73.90	21.3	150	0	
Hori.	9748.000	PK	48.07	39.31	9.08	43.02	2.24	55.68	73.90	18.2	150	0	
Vert.	4874.000	PK	48.36	31.70	6.45	42.89	2.24	45.86	73.90	28.0	150	0	
Vert.	7311.000	PK	48.02	37.36	7.90	43.13	2.24	52.39	73.90	21.5	150	0	
Vert.	9748.000	PK	48.14	39.31	9.08	43.02	2.24	55.75	73.90	18.2	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$

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	38.82	31.70	6.45	42.89	3.52	2.24	39.84	53.9	14.1	
Hori.	7311.000	AV	38.92	37.36	7.90	43.13	3.52	2.24	46.81	53.9	7.1	
Hori.	9748.000	AV	38.83	39.31	9.08	43.02	3.52	2.24	49.96	53.9	3.9	
Vert.	4874.000	AV	38.83	31.70	6.45	42.89	3.52	2.24	39.85	53.9	14.1	
Vert.	7311.000	AV	38.97	37.36	7.90	43.13	3.52	2.24	46.86	53.9	7.0	
Vert.	9748.000	AV	38.90	39.31	9.08	43.02	3.52	2.24	50.03	53.9	3.9	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$

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.	13218140S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 11, 2019	January 14, 2019
Temperature / Humidity	20 deg. C / 36 % RH	20 deg. C / 42 % RH
Engineer	Toshinori Yamada	Toshinori Yamada
	(1 GHz – 13 GHz)	(13 GHz – 26.5 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.	2483.500	PK	48.68	28.24	14.16	41.62	2.24	51.70	73.90	22.2	182	321	
Hori.	4924.000	PK	48.46	31.82	6.47	42.90	2.24	46.09	73.90	27.8	150	0	
Hori.	7386.000	PK	48.69	37.49	7.95	43.28	2.24	53.09	73.90	20.8	150	0	
Hori.	9848.000	PK	48.40	39.33	9.13	42.92	2.24	56.18	73.90	17.7	150	0	
Vert.	2483.500	PK	48.56	28.24	14.16	41.62	2.24	51.58	73.90	22.3	178	14	
Vert.	4924.000	PK	48.86	31.82	6.47	42.90	2.24	46.49	73.90	27.4	150	0	
Vert.	7386.000	PK	48.71	37.49	7.95	43.28	2.24	53.11	73.90	20.8	150	0	
Vert.	9848.000	PK	48.87	39.33	9.13	42.92	2.24	56.65	73.90	17.3	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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	38.68	28.24	14.16	41.62	3.52	2.24	45.22	53.9	8.7	*1)
Hori.	4924.000	AV	38.95	31.82	6.47	42.90	3.52	2.24	40.10	53.9	13.8	
Hori.	7386.000	AV	39.18	37.49	7.95	43.28	3.52	2.24	47.10	53.9	6.8	
Hori.	9848.000	AV	39.38	39.33	9.13	42.92	3.52	2.24	50.68	53.9	3.2	
Vert.	2483.500	AV	39.26	28.24	14.16	41.62	3.52	2.24	45.80	53.9	8.1	*1)
Vert.	4924.000	AV	38.82	31.82	6.47	42.90	3.52	2.24	39.97	53.9	13.9	
Vert.	7386.000	AV	39.12	37.49	7.95	43.28	3.52	2.24	47.04	53.9	6.9	
Vert.	9848.000	AV	39.43	39.33	9.13	42.92	3.52	2.24	50.73	53.9	3.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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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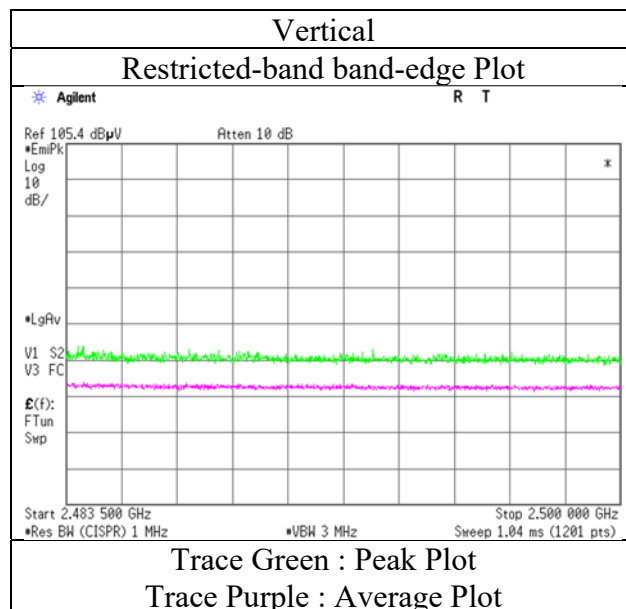
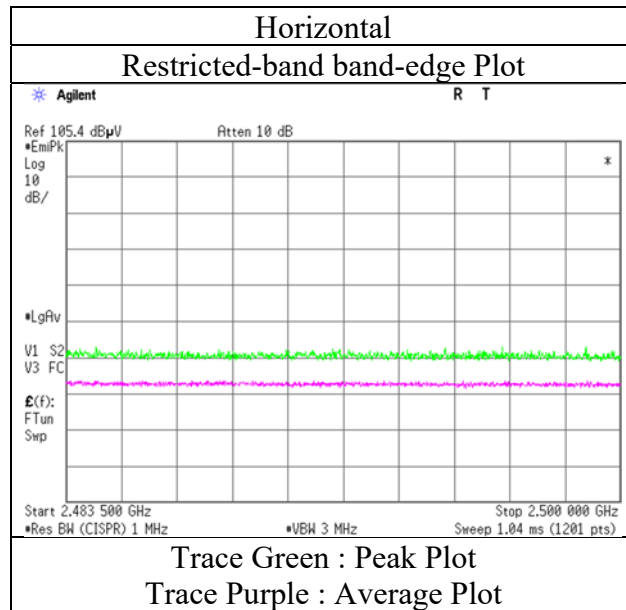
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13218140S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 20, 2019
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx 11g 2462 MHz



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

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

Radiated Spurious Emission

Report No.	13218140S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 20, 2019	January 11, 2019	January 14, 2019
Temperature / Humidity	22 deg. C / 45 % RH	20 deg. C / 36 % RH	20 deg. C / 42 % RH
Engineer	Kazuya Noda	Toshinori Yamada	Toshinori Yamada
	(30 MHz – 1 GHz)	(1 GHz – 13 GHz)	(13 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.	87.466	QP	46.30	7.60	7.60	32.16	0.00	29.34	40.00	10.6	218	259	
Hori.	128.010	QP	46.30	13.59	7.40	32.13	0.00	35.16	43.50	8.3	252	72	
Hori.	145.779	QP	46.60	14.51	7.76	32.12	0.00	36.75	43.50	6.7	229	82	
Hori.	198.001	QP	36.80	16.35	7.90	32.07	0.00	28.98	43.50	14.5	146	305	
Hori.	391.497	QP	47.30	15.21	9.22	31.96	0.00	39.77	46.00	6.2	100	319	
Hori.	404.994	QP	44.70	15.56	9.28	31.97	0.00	37.57	46.00	8.4	100	345	
Hori.	566.989	QP	44.80	17.93	9.88	31.97	0.00	40.64	46.00	5.3	100	13	
Hori.	960.267	QP	41.20	21.68	11.20	30.56	0.00	43.52	53.90	10.3	100	277	
Hori.	2390.000	PK	47.53	28.33	14.07	41.59	2.24	50.58	73.90	23.3	176	358	
Hori.	4824.000	PK	48.74	31.64	6.42	42.88	2.24	46.16	73.90	27.7	150	0	
Hori.	7236.000	PK	48.25	37.25	7.86	42.98	2.24	52.62	73.90	21.3	150	0	
Hori.	9648.000	PK	48.16	38.97	9.04	43.13	2.24	55.28	73.90	18.6	150	0	
Vert.	593.992	QP	35.60	18.83	9.97	31.94	0.00	32.46	46.00	13.5	115	245	
Vert.	809.993	QP	35.80	20.40	10.74	31.57	0.00	35.37	46.00	10.6	100	342	
Vert.	2390.000	PK	50.15	28.33	14.07	41.59	2.24	53.20	73.90	20.7	102	52	
Vert.	4824.000	PK	48.89	31.64	6.42	42.88	2.24	46.31	73.90	27.6	150	0	
Vert.	7236.000	PK	48.30	37.25	7.86	42.98	2.24	52.67	73.90	21.2	150	0	
Vert.	9648.000	PK	47.94	38.97	9.04	43.13	2.24	55.06	73.90	18.8	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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	38.21	28.33	14.07	41.59	3.45	2.24	44.71	53.9	9.2	*1)
Hori.	4824.000	AV	38.90	31.64	6.42	42.88	3.45	2.24	39.77	53.9	14.1	
Hori.	7236.000	AV	38.88	37.25	7.86	42.98	3.45	2.24	46.70	53.9	7.2	
Hori.	9648.000	AV	38.22	38.97	9.04	43.13	3.45	2.24	48.79	53.9	5.1	
Vert.	2390.000	AV	39.63	28.33	14.07	41.59	3.45	2.24	46.13	53.9	7.8	*1)
Vert.	4824.000	AV	38.86	31.64	6.42	42.88	3.45	2.24	39.73	53.9	14.2	
Vert.	7236.000	AV	38.78	37.25	7.86	42.98	3.45	2.24	46.60	53.9	7.3	
Vert.	9648.000	AV	38.39	38.97	9.04	43.13	3.45	2.24	48.96	53.9	4.9	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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	82.53	28.29	14.08	41.60	2.24	85.54	-	-	Carrier
Hori.	2400.000	PK	42.46	28.31	14.07	41.60	2.24	45.48	65.54	20.1	
Vert.	2412.000	PK	87.82	28.29	14.08	41.60	2.24	90.83	-	-	Carrier
Vert.	2400.000	PK	46.32	28.31	14.07	41.60	2.24	49.34	70.83	21.5	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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

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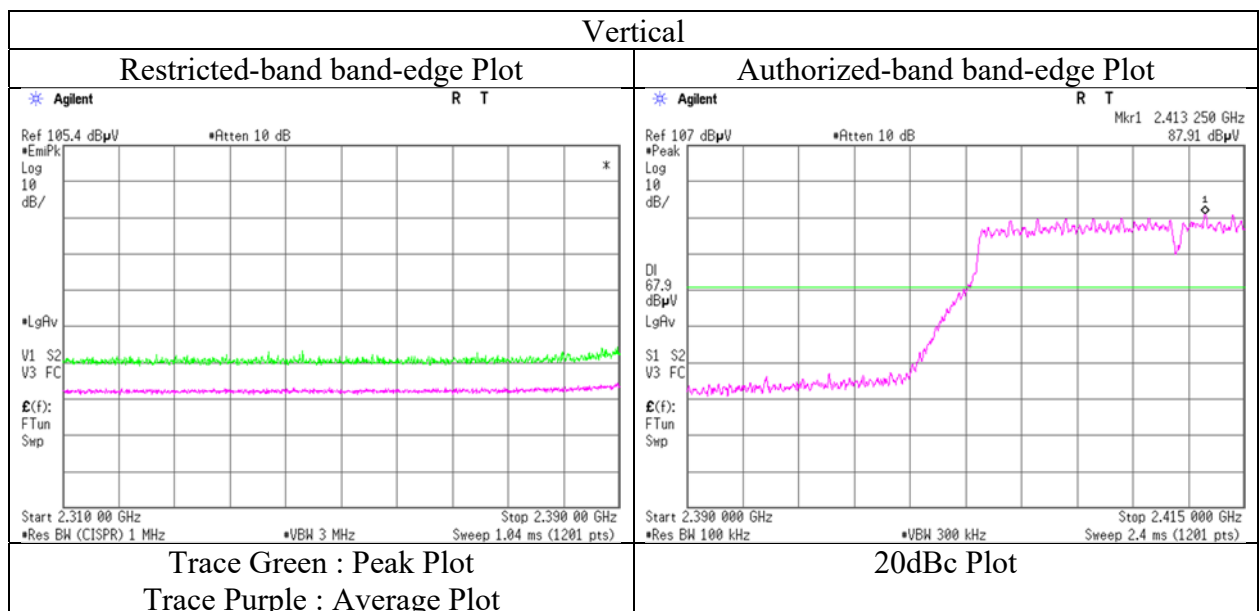
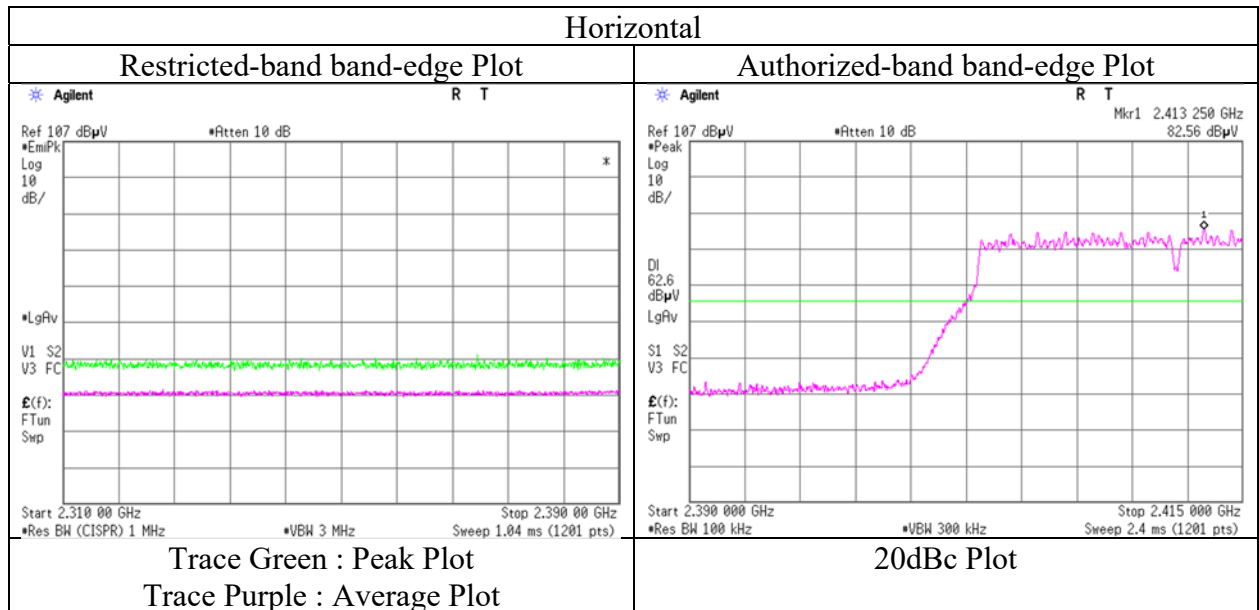
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13218140S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 20, 2019
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-20 2412 MHz



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

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

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Radiated Spurious Emission

Report No. 13218140S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3 No.2
Date January 11, 2019 January 14, 2019
Temperature / Humidity 20 deg. C / 36 % RH 20 deg. C / 42 % RH
Engineer Toshinori Yamada Toshinori Yamada
(1 GHz – 13 GHz) (13 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	48.68	31.70	6.45	42.89	2.24	46.18	73.90	27.7	150	0	
Hori.	7311.000	PK	48.19	37.36	7.90	43.13	2.24	52.56	73.90	21.3	150	0	
Hori.	9748.000	PK	47.93	39.31	9.08	43.02	2.24	55.54	73.90	18.4	150	0	
Vert.	4874.000	PK	48.82	31.70	6.45	42.89	2.24	46.32	73.90	27.6	150	0	
Vert.	7311.000	PK	48.56	37.36	7.90	43.13	2.24	52.93	73.90	21.0	150	0	
Vert.	9748.000	PK	48.26	39.31	9.08	43.02	2.24	55.87	73.90	18.0	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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	38.80	31.70	6.45	42.89	3.45	2.24	39.75	53.90	14.2	
Hori.	7311.000	AV	39.20	37.36	7.90	43.13	3.45	2.24	47.02	53.90	6.9	
Hori.	9748.000	AV	39.03	39.31	9.08	43.02	3.45	2.24	50.09	53.90	3.8	
Vert.	4874.000	AV	38.93	31.70	6.45	42.89	3.45	2.24	39.88	53.90	14.0	
Vert.	7311.000	AV	39.01	37.36	7.90	43.13	3.45	2.24	46.83	53.90	7.1	
Vert.	9748.000	AV	38.92	39.31	9.08	43.02	3.45	2.24	49.98	53.90	3.9	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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.	13218140S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 11, 2019	January 14, 2019
Temperature / Humidity	20 deg. C / 36 % RH	20 deg. C / 42 % RH
Engineer	Toshinori Yamada	Toshinori Yamada
	(1 GHz – 13 GHz)	(13 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	48.26	28.24	14.16	41.62	2.24	51.28	73.90	22.6	177	314	
Hori.	4924.000	PK	48.17	31.82	6.47	42.90	2.24	45.80	73.90	28.1	150	0	
Hori.	7386.000	PK	48.57	37.49	7.95	43.28	2.24	52.97	73.90	20.9	150	0	
Hori.	9848.000	PK	48.37	39.33	9.13	42.92	2.24	56.15	73.90	17.8	150	0	
Vert.	2483.500	PK	49.35	28.24	14.16	41.62	2.24	52.37	73.90	21.5	135	60	
Vert.	4924.000	PK	48.34	31.82	6.47	42.90	2.24	45.97	73.90	27.9	150	0	
Vert.	7386.000	PK	48.57	37.49	7.95	43.28	2.24	52.97	73.90	20.9	150	0	
Vert.	9848.000	PK	48.54	39.33	9.13	42.92	2.24	56.32	73.90	17.6	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

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	38.72	28.24	14.16	41.62	3.45	2.24	45.19	53.9	8.7	*1)
Hori.	4924.000	AV	38.75	31.82	6.47	42.90	3.45	2.24	39.83	53.9	14.1	
Hori.	7386.000	AV	39.02	37.49	7.95	43.28	3.45	2.24	46.87	53.9	7.0	
Hori.	9848.000	AV	39.56	39.33	9.13	42.92	3.45	2.24	50.79	53.9	3.1	
Vert.	2483.500	AV	39.45	28.24	14.16	41.62	3.45	2.24	45.92	53.9	8.0	*1)
Vert.	4924.000	AV	38.93	31.82	6.47	42.90	3.45	2.24	40.01	53.9	13.9	
Vert.	7386.000	AV	39.00	37.49	7.95	43.28	3.45	2.24	46.85	53.9	7.0	
Vert.	9848.000	AV	39.35	39.33	9.13	42.92	3.45	2.24	50.58	53.9	3.3	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

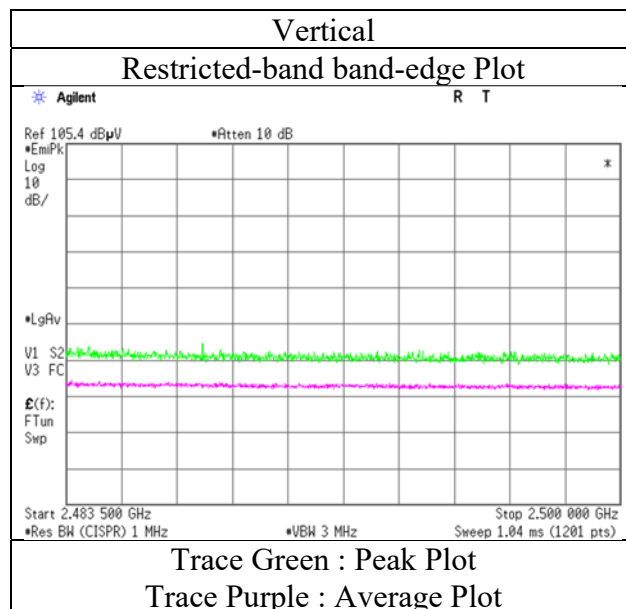
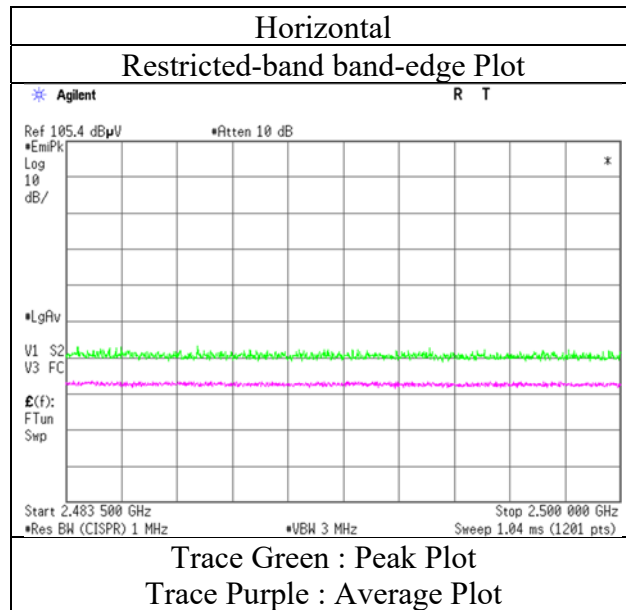
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13218140S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 20, 2019
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-20 2462 MHz

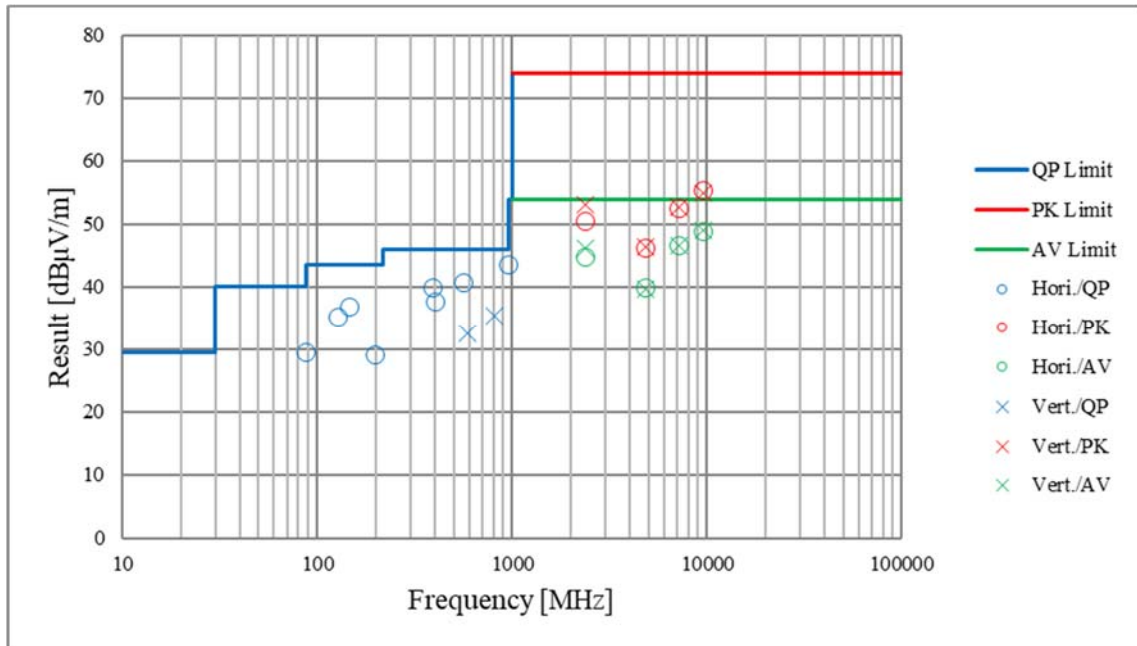


* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

Radiated Spurious Emission
(Plot data, Worst case)

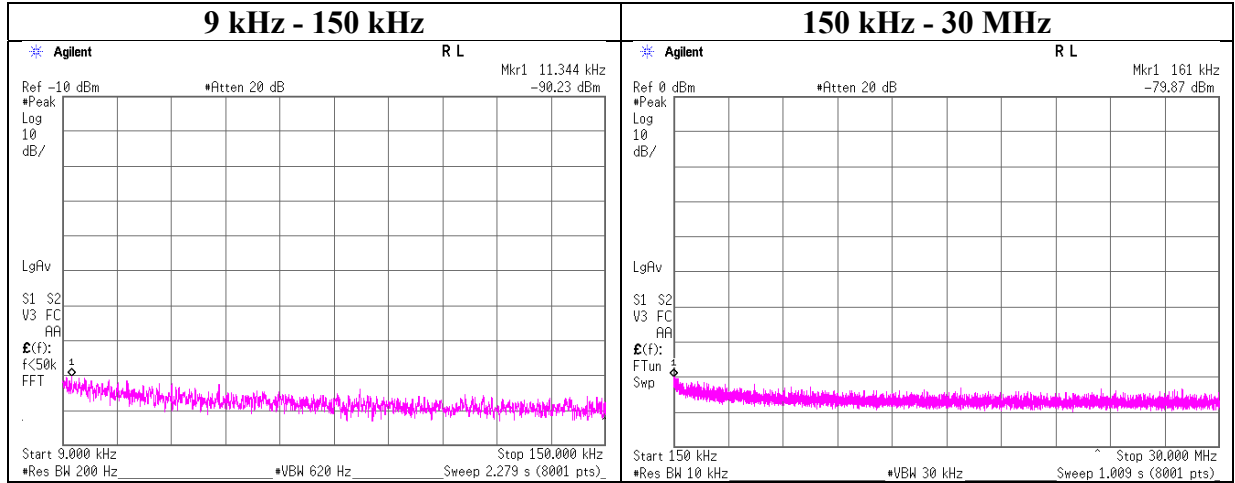
Report No.	13218140S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 20, 2019	January 20, 2019	January 14, 2019
Temperature / Humidity	22 deg. C / 45 % RH	22 deg. C / 45 % RH	20 deg. C / 42 % RH
Engineer	Kazuya Noda	Kazuya Noda	Toshinori Yamada
	(30 MHz – 1 GHz)	(1 GHz – 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11n-20 2412 MHz		



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

Conducted Spurious Emission

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date February 8, 2020
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Makoto Hosaka
Mode Tx 11n-20 2412 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
11.34	-90.2	0.04	9.7	2.0	1	-78.4	300	6.0	-17.2	46.5	63.7	
161.00	-79.9	0.01	9.7	2.0	1	-68.1	300	6.0	-6.9	23.4	30.3	

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

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

N: Number of output

*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

Power Density

Report No. 13218140S-A-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date February 8, 2020
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Makoto Hosaka
Mode Tx

11b

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-17.25	1.73	9.82	-5.70	8.00	13.70
2437	-17.97	1.74	9.82	-6.41	8.00	14.41
2462	-18.55	1.75	9.82	-6.98	8.00	14.98

11g

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-25.39	1.73	9.82	-13.84	8.00	21.84
2437	-25.44	1.74	9.82	-13.88	8.00	21.88
2462	-25.81	1.75	9.82	-14.24	8.00	22.24

11n-20

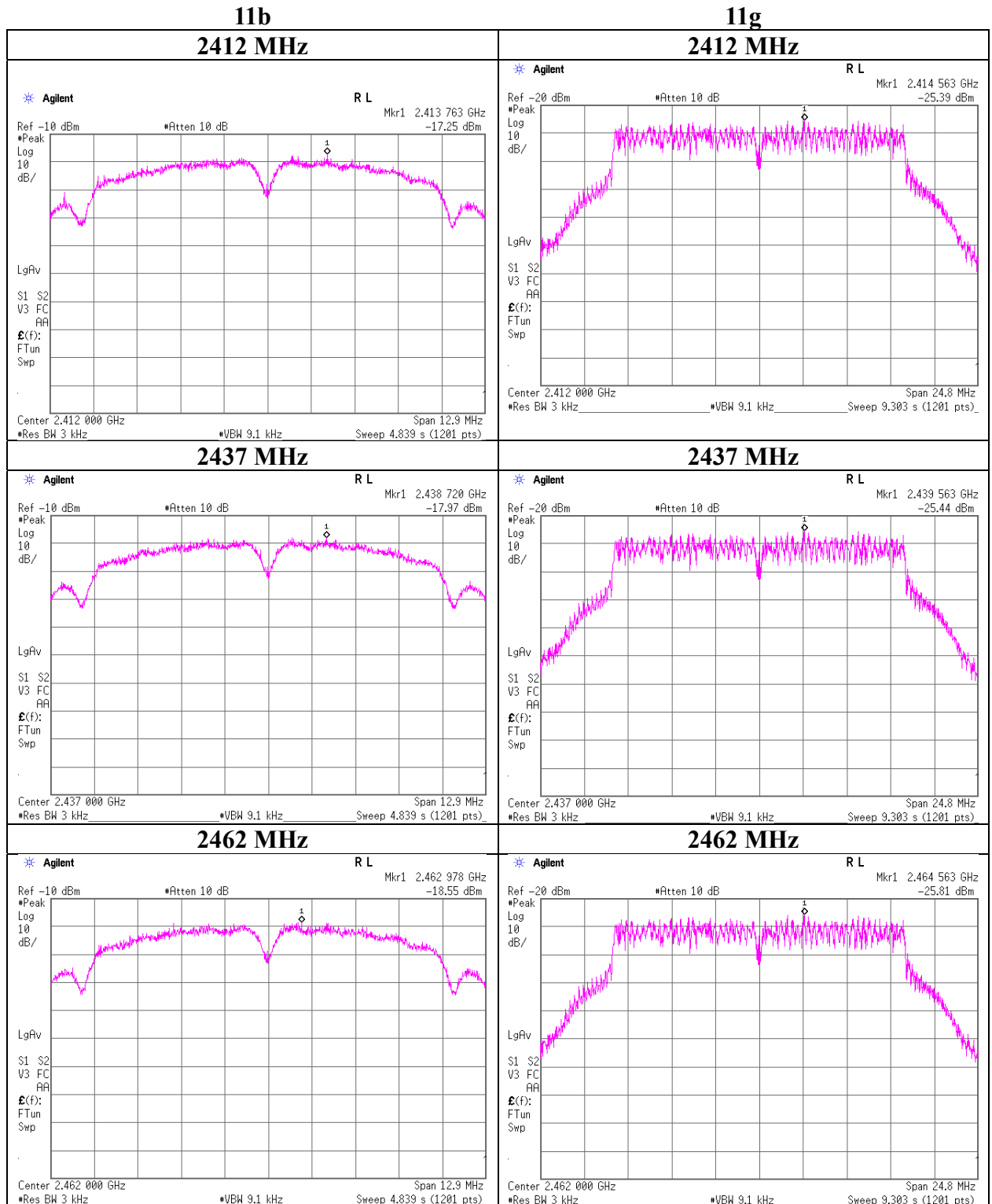
Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-25.29	1.73	9.82	-13.74	8.00	21.74
2437	-24.79	1.74	9.82	-13.23	8.00	21.23
2462	-25.22	1.75	9.82	-13.65	8.00	21.65

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.

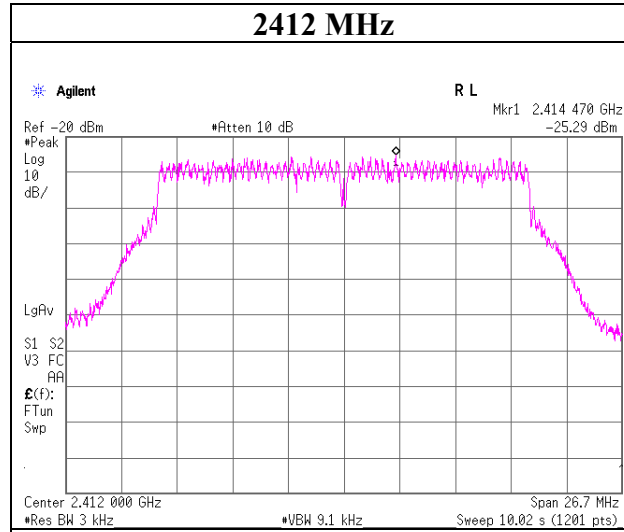
Power Density



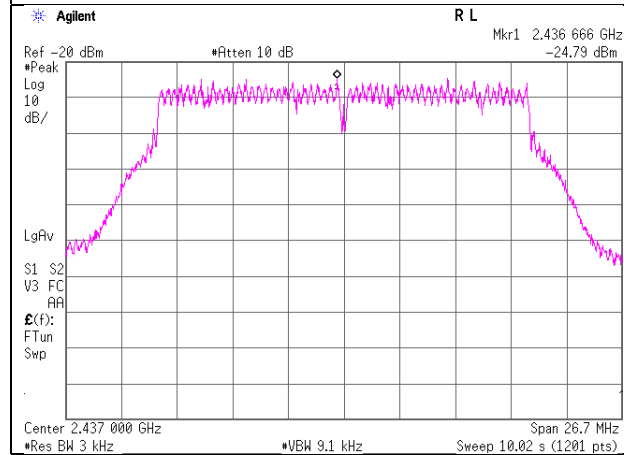
Power Density

11n-20

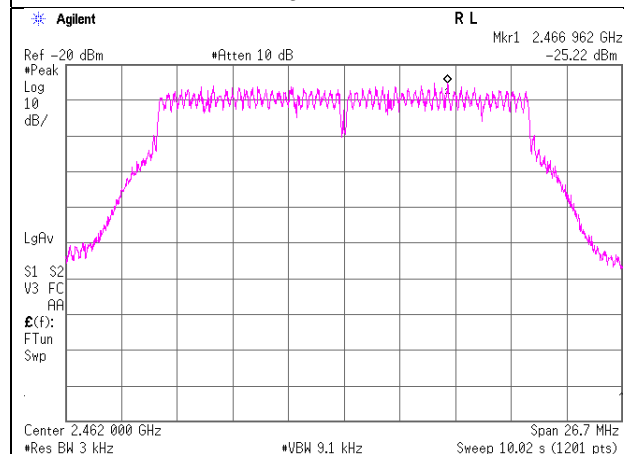
2412 MHz



2437 MHz



2462 MHz



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APPENDIX 2: Test instruments

Test Instruments [1/2]

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
AT	SAT10-14	154591	Attenuator	Weinschel Corp.	54A-10	81595	2019/04/16	12
AT	SAT20-07	145155	Attenuator	Weinschel Corp.	54A-20	31484	2019/04/16	12
AT	SCC-G12	145040	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	2019/03/27	12
AT	SCC-G34	151611	Coaxial Cable	Junkosha	MWX241-01000KMSKMS/B	1612Q032	2019/12/23	12
AT	SOS-22	191839	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
AT	SOS-24	191841	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
AT	SOS-27	191845	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
AT	SPM-07	146247	Power Meter	Keysight Technologies Inc	8990B	MY5100272	2019/07/16	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2020/01/28	12
AT	SPSS-04	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2019/07/16	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2020/01/28	12
AT	STM-G10	171617	Terminator	Weinschel - API Technologies Corp	M1459A	92420	2019/07/04	12
AT	STM-G8	171615	Terminator	Weinschel - API Technologies Corp	M1459A	88997	2019/07/04	12
AT	STM-G9	171616	Terminator	Weinschel - API Technologies Corp	M1459A	89025	2019/07/04	12
AT,RE	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2019/08/08	12
AT,RE	STS-02	145793	Digital Hitester	HIOKI	3805-50	80997819	2019/04/02	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2019/05/09	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2019/04/08	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2019/05/03	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2020/02/20	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2019/07/12	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2020/02/20	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2019/03/05	12
RE	SAT10-05	145136	Attenuator(above1GHz)	Keysight Technologies Inc	8493C-010	74864	2019/11/06	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2019/11/06	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2020/02/21	12
RE	SBA-03	145023	Biconical Antenna	Schwarzbeck	BBA9106	91032666	2019/05/07	12

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Test Instruments [2/2]

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable & RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	/0901-271(RF Selector)	2019/04/19	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2019/03/27	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2020/01/08	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2020/01/08	12
RE	SCC-G43	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	SN MY 13406/4E	2019/07/03	12
RE	SCC-G50	178573	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	MY13407/4E	2019/03/26	12
RE	SCC-G51	178572	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800288 /4A	2019/03/26	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2019/05/16	12
RE	SCC-G58	183047	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800287/4A	2019/07/23	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2019/11/06	12
RE	SFL-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2019/04/16	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	2019/06/26	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	2019/06/26	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2019/06/26	12
RE	SJM-09	145336	Measure	PROMART	SEN1935	-	-	-
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	2019/05/07	12
RE	SOS-05	146293	Humidity Indicator	A&D	AD-5681	4062518	2019/10/08	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
RE,AT	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2019/04/04	12
RE,AT	STS-03	146210	Digital Hitester	HIOKI	3805-50	80997823	2019/10/01	12

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

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

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

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

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

UL Japan, Inc.

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