



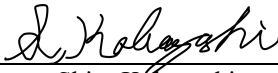
RADIO TEST REPORT

Test Report No. : 13273483S-A-R2

Applicant : Panasonic Corporation
Type of EUT : Seat Back ECU
Model Number of EUT : AT2002
FCC ID : ACJ932AT2002
Test regulation : FCC Part 15 Subpart C: 2019
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 13273483S-A-R1. 13273483S-A-R1 is replaced with this report.

Date of test: March 12 to 20, 2020

Representative test engineer: 
Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by: 
Shinichi Takano
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.: 13273483S

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13273483S-A	April 3, 2020	-	-
1	13273483S-A-R1	April 13, 2020	9, 48-49	Move “Configuration and peripherals” from 4.2 to APPENDIX 4
2	13273483S-A-R2	April 20, 2020	All pages	Correction of total page from “48” to “49”

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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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SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Address	:	4261, Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa-ken, 224-8520, Japan
Telephone Number	:	+81-50-3380-5341
Facsimile Number	:	+81-45-931-0806
Contact Person	:	Yuki Tojo

The information provided from the customer is as follows;

- Applicant, Type of EUT, Model Number of EUT, 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 (EUT)
- SECTION 4: Operation of EUT 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 (EUT)

2.1 Identification of EUT

Type of Equipment	:	Seat Back ECU
Model No.	:	AT2002
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 13.2 V
Receipt Date of Sample (Information from test lab.)	:	March 12, 2020
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering 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: AT2002 (referred to as the EUT in this report) is a Seat Back ECU.

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS, OFDM
Antenna type	:	Dipole
Antenna Gain	:	0.85 dBi
Clock frequency (Maximum)	:	48 MHz

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

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	*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	FCC: Section 15.247(d)	6.2 dB 9648.00 MHz, AV, Vertical Tx 11n-20, 2412 MHz	Complied d), e)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
	ISED: RSS-Gen 6.13	ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

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

*1) The test is not applicable since the EUT has no AC mains.

*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)

The equipment provides the wireless transmitter with stable power supply.

Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the 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	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
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 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
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB
Radiated emission (Measurement distance: 1 m)	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 1 GHz	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 EUT 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)	2 Mbps, PN9
IEEE 802.11g (11g)	24 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 7, 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: 11 dBm Software: WIFI Diag ver.9.94 (Date: 2020.03.12, Storage location: EUT memory)	
* 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 (below 1 GHz)	11n-20 Tx	2412 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		
Spurious Emission (above 1 GHz)	11b Tx	2412 MHz
	11g Tx	2437 MHz
	11n-20 Tx	2462 MHz

4.2 Configuration and peripherals

The pages have been submitted for separate exhibit (refer to APPENDIX 4).

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 platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity. 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.

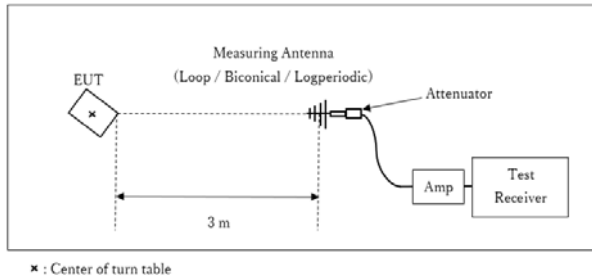
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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	11.12.2.5.2 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.

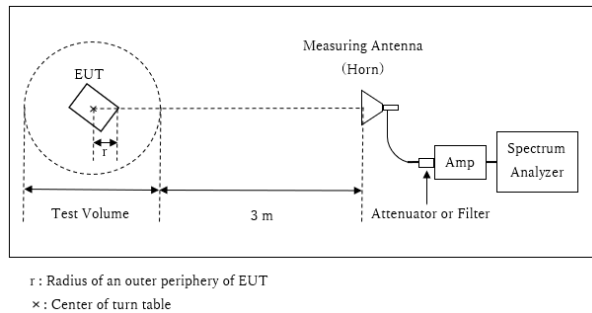
Figure 1: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 13 GHz



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

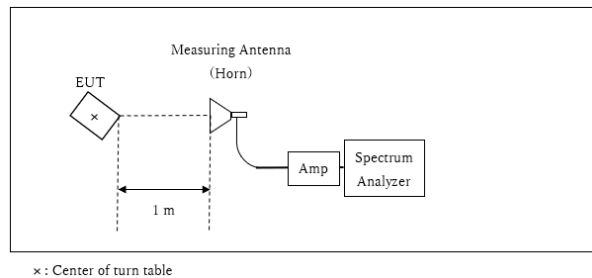
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.88 \text{ m}$

Test Volume : 2.0 m

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

r = 0.12 m

13 GHz – 26.5 GHz



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

*Test Distance: 1 m

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

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

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

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

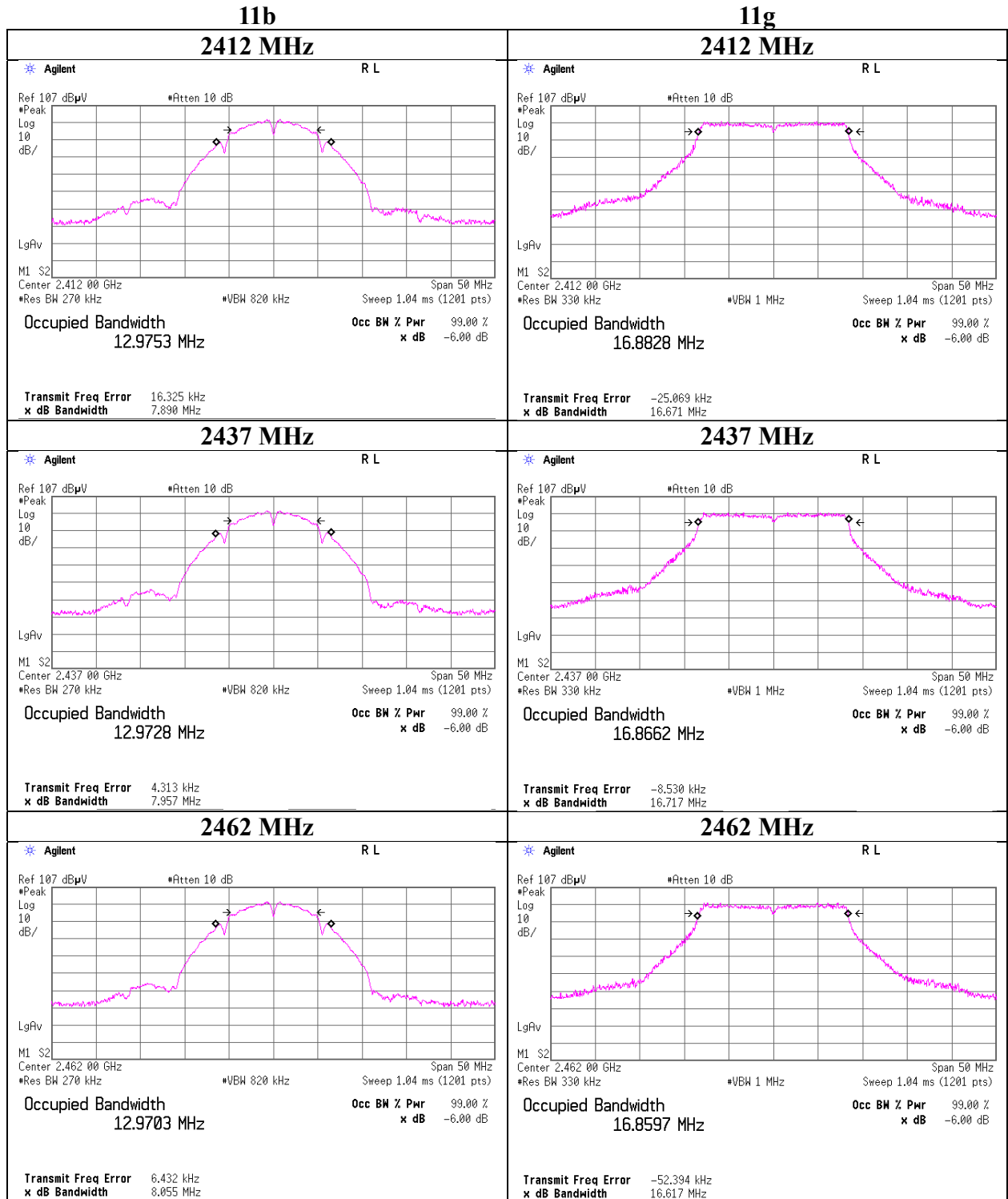
APPENDIX 1: Test data

6 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	12975.3	7.714	> 0.5000
	2437	12972.8	7.792	> 0.5000
	2462	12970.3	7.890	> 0.5000
11g	2412	16882.8	16.556	> 0.5000
	2437	16866.2	16.519	> 0.5000
	2462	16859.7	16.546	> 0.5000
11n-20	2412	17974.7	17.766	> 0.5000
	2437	18009.7	17.732	> 0.5000
	2462	18002.1	17.778	> 0.5000

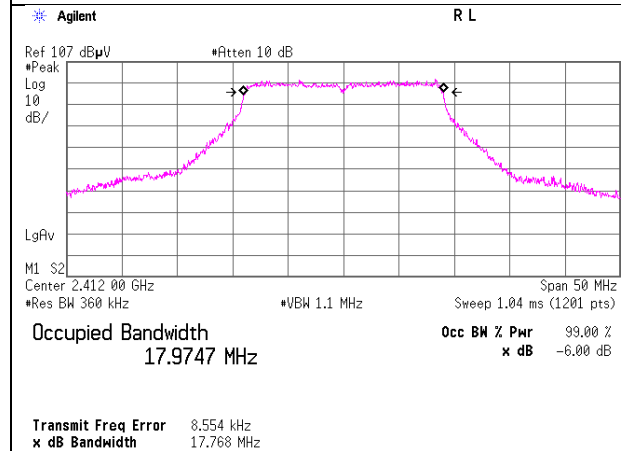
99%Occupied Bandwidth



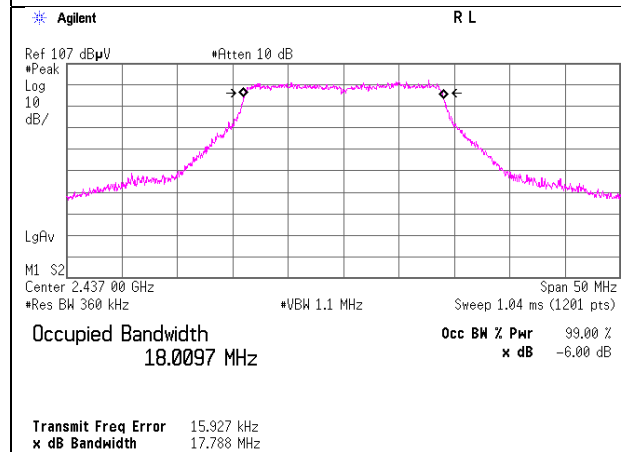
99% Occupied Bandwidth

11n-20

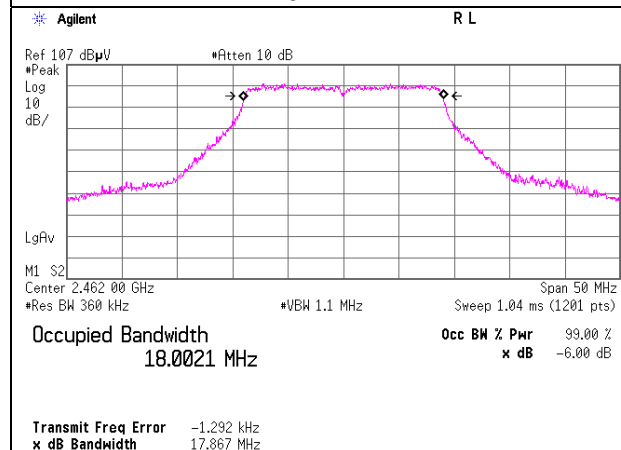
2412 MHz



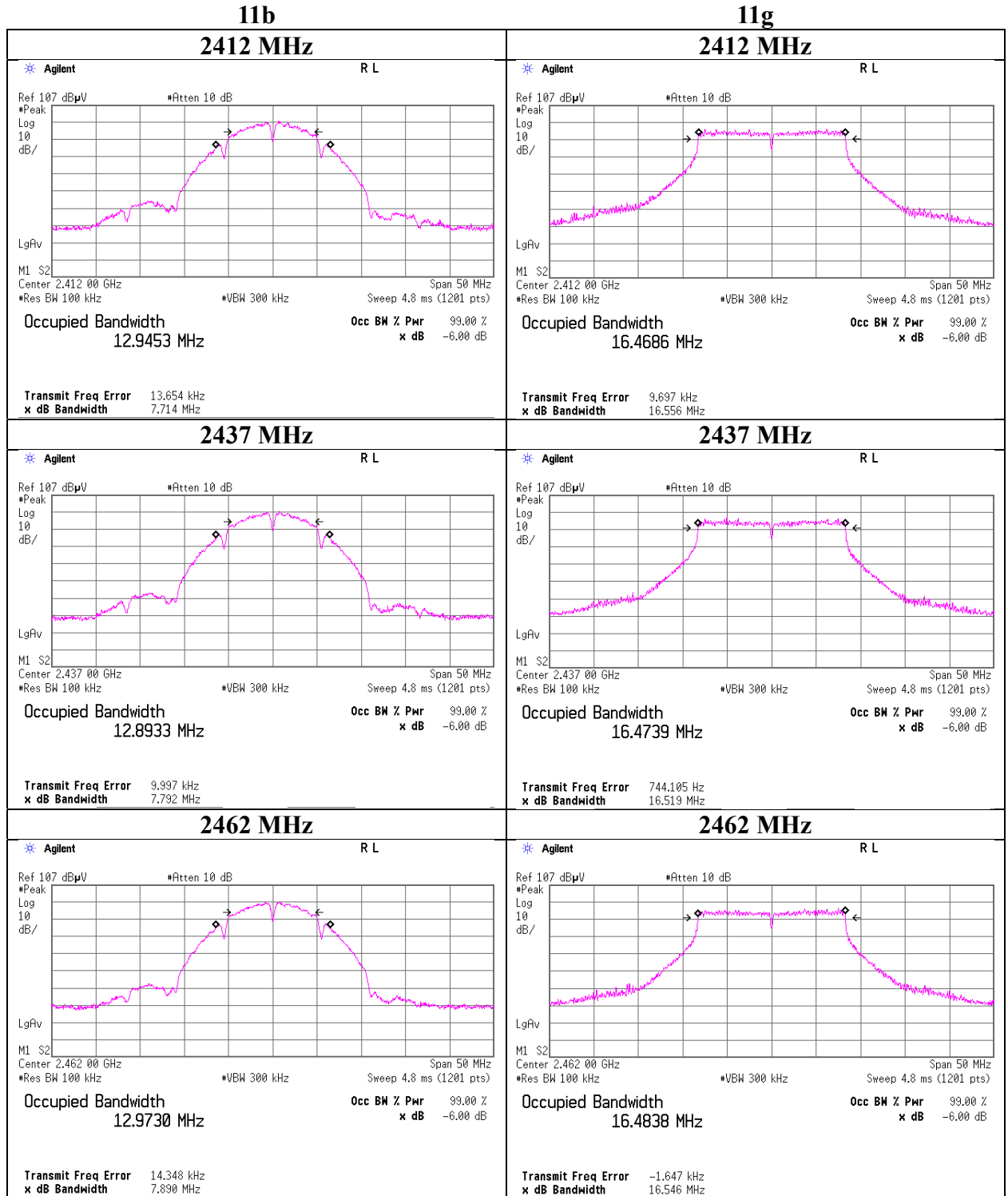
2437 MHz



2462 MHz



6dB Bandwidth



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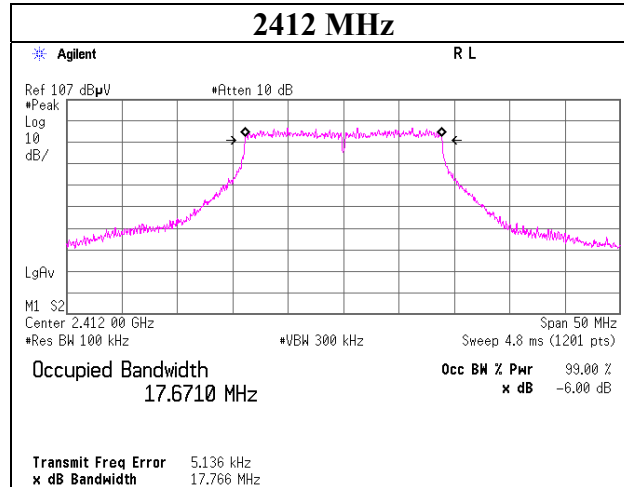
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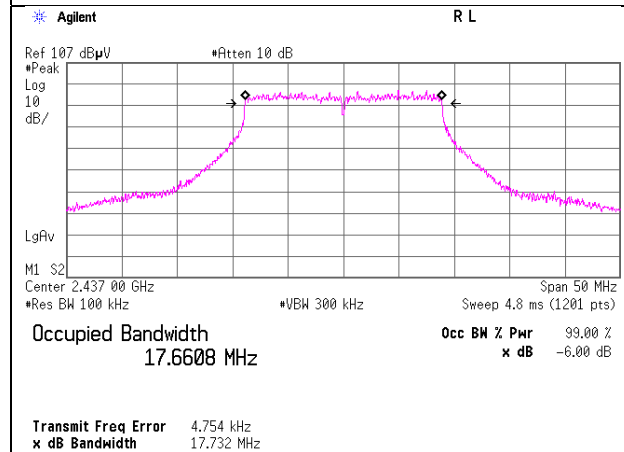
6dB Bandwidth

11n-20

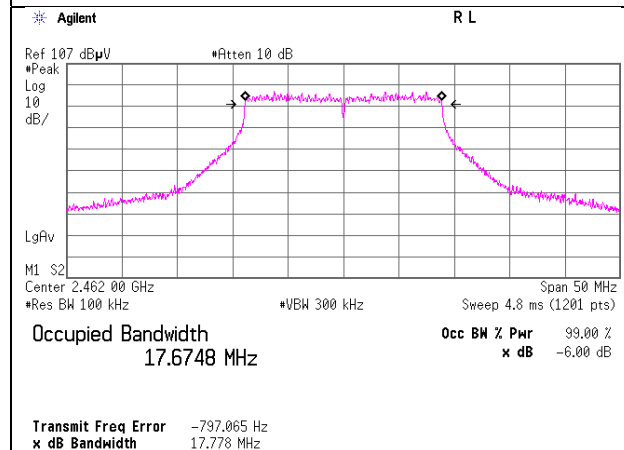
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Report No. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx 11b

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]			[dBm]	[mW]	[dBm]	[mW]	
2412	1.28	2.30	10.18	13.76	23.77	30.00	1000	16.24	0.85	14.61	28.91	36.02	4000	21.41
2437	1.22	2.31	10.18	13.71	23.50	30.00	1000	16.29	0.85	14.56	28.58	36.02	4000	21.46
2462	1.15	2.31	10.18	13.64	23.12	30.00	1000	16.36	0.85	14.49	28.12	36.02	4000	21.53

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

Rate	Reading	Remark
[Mbps]	[dBm]	
1	0.98	-
2	1.22	*
5.5	1.07	-
11	1.15	-

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
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]			[dBm]	[mW]	[dBm]	[mW]	
2412	8.92	2.30	10.18	21.40	138.04	30.00	1000	8.60	0.85	22.25	167.88	36.02	4000	13.77
2437	8.87	2.31	10.18	21.36	136.77	30.00	1000	8.64	0.85	22.21	166.34	36.02	4000	13.81
2462	8.79	2.31	10.18	21.28	134.28	30.00	1000	8.72	0.85	22.13	163.31	36.02	4000	13.89

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	4.53	-
9	4.59	-
12	4.58	-
18	4.82	-
24	8.87	*
36	8.84	-
48	8.24	-
54	8.72	-

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
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]			[dBm]	[mW]	[dBm]	[mW]	
2412	9.24	2.30	10.18	21.72	148.59	30.00	1000	8.28	0.85	22.57	180.72	36.02	4000	13.45
2437	9.17	2.31	10.18	21.66	146.55	30.00	1000	8.34	0.85	22.51	178.24	36.02	4000	13.51
2462	8.55	2.31	10.18	21.04	127.06	30.00	1000	8.96	0.85	21.89	154.53	36.02	4000	14.13

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
[MCS]	[dBm]	
0	4.77	-
1	4.51	-
2	4.86	-
3	8.57	-
4	8.62	-
5	8.53	-
6	8.99	-
7	9.17	*

*: Worst Rate

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

Average Output Power
(Reference data for RF Exposure)

Report No. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx

11b 2 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	-1.42	2.30	10.18	11.06	12.76	0.01	11.07	12.79
2437	-1.48	2.31	10.18	11.01	12.62	0.01	11.02	12.65
2462	-1.58	2.31	10.18	10.91	12.33	0.01	10.92	12.36

11g 24 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	-1.55	2.30	10.18	10.93	12.39	0.08	11.01	12.62
2437	-1.61	2.31	10.18	10.88	12.25	0.08	10.96	12.47
2462	-1.74	2.31	10.18	10.75	11.89	0.08	10.83	12.11

11n-20 MCS 7

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	-1.65	2.30	10.18	10.83	12.11	0.21	11.04	12.71
2437	-1.73	2.31	10.18	10.76	11.91	0.21	10.97	12.50
2462	-1.84	2.31	10.18	10.65	11.61	0.21	10.86	12.19

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.

Average Output Power **(Reference data for RF Exposure)**

Report No.	13273483S-A-R2
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	March 12, 2020
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Shiro Kobayashi
Mode	Tx

2437 MHz

Mode	Rate Mbps / MCS	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b	1	-1.66	0.01	-1.65	-
	2	-1.48	0.01	-1.47	*
	5.5	-1.53	0.01	-1.52	-
	11	-1.52	0.03	-1.49	-
11g	6	-1.97	0.02	-1.95	-
	9	-2.00	0.03	-1.97	-
	12	-1.96	0.04	-1.92	-
	18	-2.00	0.05	-1.95	-
	24	-1.61	0.08	-1.53	*
	36	-1.70	0.11	-1.59	-
	48	-1.72	0.14	-1.58	-
	54	-1.71	0.16	-1.55	-
11n-20	0	-2.16	0.02	-2.14	-
	1	-2.20	0.04	-2.16	-
	2	-2.22	0.06	-2.16	-
	3	-1.72	0.08	-1.64	-
	4	-1.72	0.12	-1.60	-
	5	-1.79	0.16	-1.63	-
	6	-1.80	0.18	-1.62	-
	7	-1.73	0.21	-1.52	*

* Worst rate

Sample Calculation:

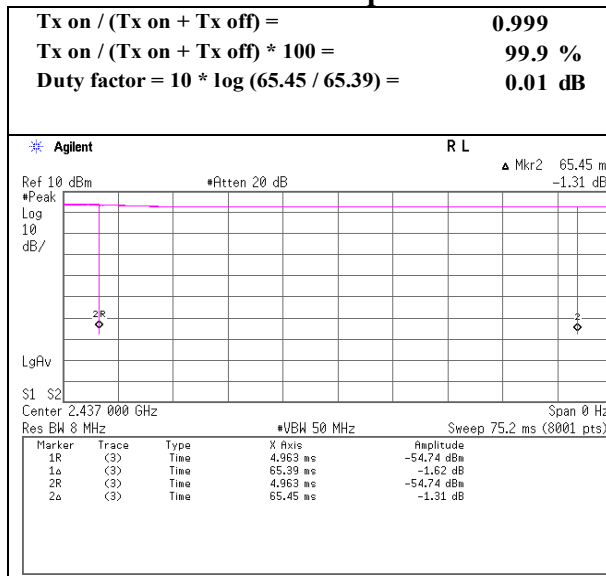
Burst power = Reading (timed average) + Duty factor

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

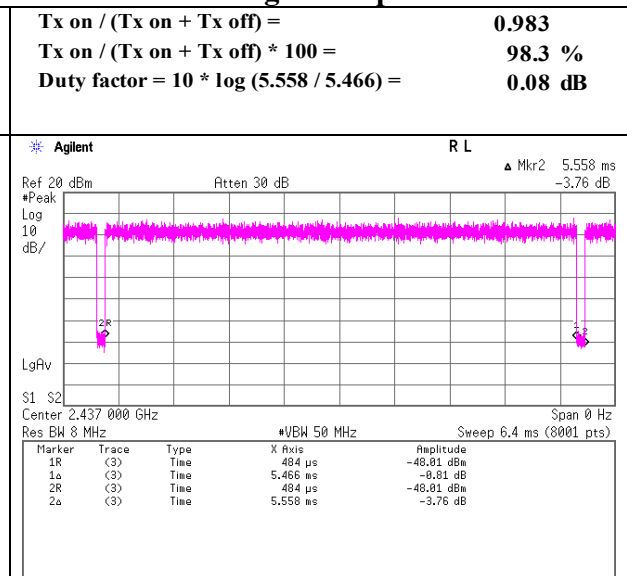
Burst rate confirmation

Report No. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx

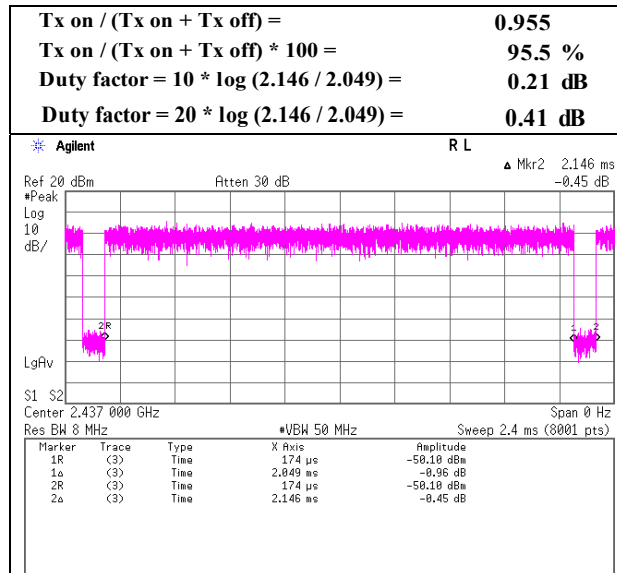
11b 2 Mbps



11g 24 Mbps



11n-20 MCS 7



* 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. 13273483S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 3 3
Date March 17, 2020 March 19, 2020 March 20, 2020
Temperature / Humidity 22 deg. C / 33 % RH 21 deg. C / 32 % RH 22 deg. C / 42 % RH
Engineer Takahiro Kawakami Takahiro Kawakami Toshinori Yamada
(1 GHz - 13 GHz) (13 GHz - 18 GHz) (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	48.98	28.33	14.11	41.66	2.24	52.00	73.9	21.9	331	347	
Hori.	4824.000	PK	50.48	31.64	6.47	42.93	2.24	47.90	73.9	26.0	254	58	
Hori.	7236.000	PK	48.48	37.25	7.95	43.41	2.24	52.51	73.9	21.3	150	0	
Hori.	9648.000	PK	48.63	38.97	9.12	43.10	2.24	55.86	73.9	18.0	150	0	
Hori.	19296.000	PK	44.63	40.45	13.74	48.20	-9.54	41.08	73.9	32.8	167	355	
Hori.	2390.000	AV	38.81	28.33	14.11	41.66	2.24	41.83	53.9	12.0	331	347	
Hori.	4824.000	AV	42.28	31.64	6.47	42.93	2.24	39.70	53.9	14.2	254	58	
Hori.	7236.000	AV	38.80	37.25	7.95	43.41	2.24	42.83	53.9	11.0	150	0	
Hori.	9648.000	AV	38.81	38.97	9.12	43.10	2.24	46.04	53.9	7.8	150	0	
Hori.	19296.000	AV	36.12	40.45	13.74	48.20	-9.54	32.57	53.9	21.3	167	355	
Vert.	2390.000	PK	48.15	28.33	14.11	41.66	2.24	51.17	73.9	22.7	277	40	
Vert.	3774.679	PK	51.85	29.91	5.85	42.27	2.24	47.58	73.9	26.3	240	25	
Vert.	4455.114	PK	53.69	30.81	6.24	42.83	2.24	50.15	73.9	23.7	183	203	
Vert.	4824.000	PK	49.41	31.64	6.47	42.93	2.24	46.83	73.9	27.0	334	106	
Vert.	7236.000	PK	47.63	37.25	7.95	43.41	2.24	51.66	73.9	22.2	150	0	
Vert.	9648.000	PK	48.20	38.97	9.12	43.10	2.24	55.43	73.9	18.4	150	0	
Vert.	19296.000	PK	48.05	40.45	13.74	48.20	-9.54	44.50	73.9	29.4	164	357	
Vert.	2390.000	AV	38.65	28.33	14.11	41.66	2.24	41.67	53.9	12.2	277	40	
Vert.	3774.679	AV	46.90	29.91	5.85	42.27	2.24	42.63	53.9	11.2	240	25	
Vert.	4455.114	AV	48.54	30.81	6.24	42.83	2.24	45.00	53.9	8.9	183	203	
Vert.	4824.000	AV	41.54	31.64	6.47	42.93	2.24	38.96	53.9	14.9	334	106	
Vert.	7236.000	AV	38.49	37.25	7.95	43.41	2.24	42.52	53.9	11.3	150	0	
Vert.	9648.000	AV	38.84	38.97	9.12	43.10	2.24	46.07	53.9	7.8	150	0	
Vert.	19296.000	AV	42.88	40.45	13.74	48.20	-9.54	39.33	53.9	14.5	164	357	

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 - 26.5 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	89.65	28.29	14.12	41.67	2.24	92.63	-	-	Carrier
Hori.	2400.000	PK	41.00	28.31	14.11	41.67	2.24	43.99	72.63	28.6	
Vert.	2412.000	PK	91.34	28.29	14.12	41.67	2.24	94.32	-	-	Carrier
Vert.	2400.000	PK	41.07	28.31	14.11	41.67	2.24	44.06	74.32	30.2	

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

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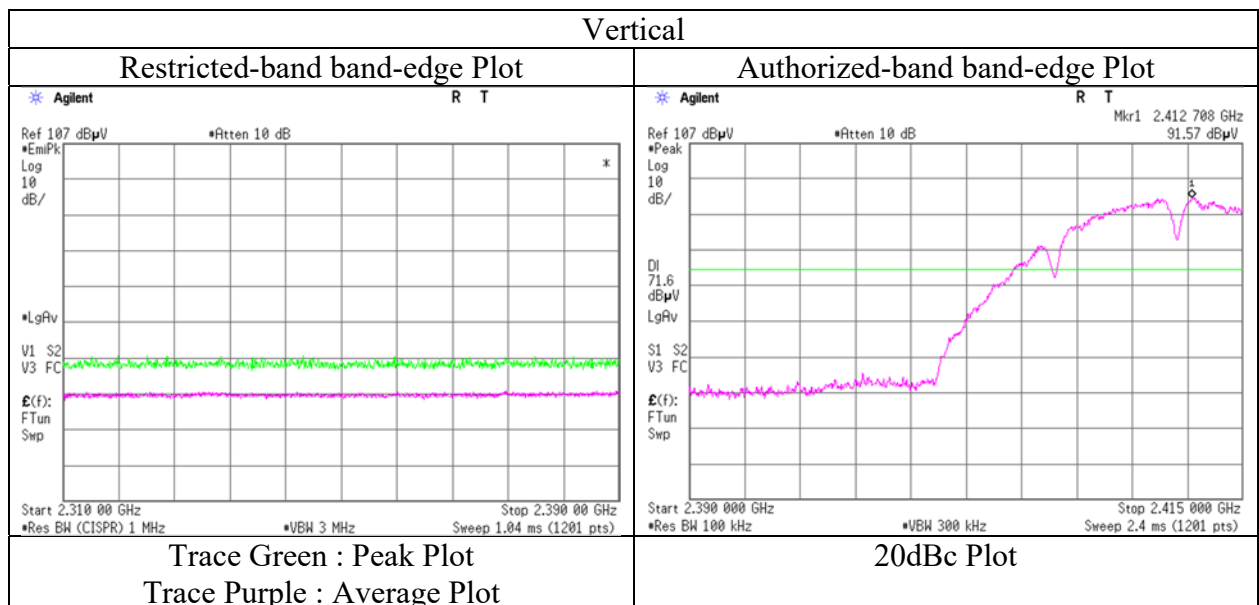
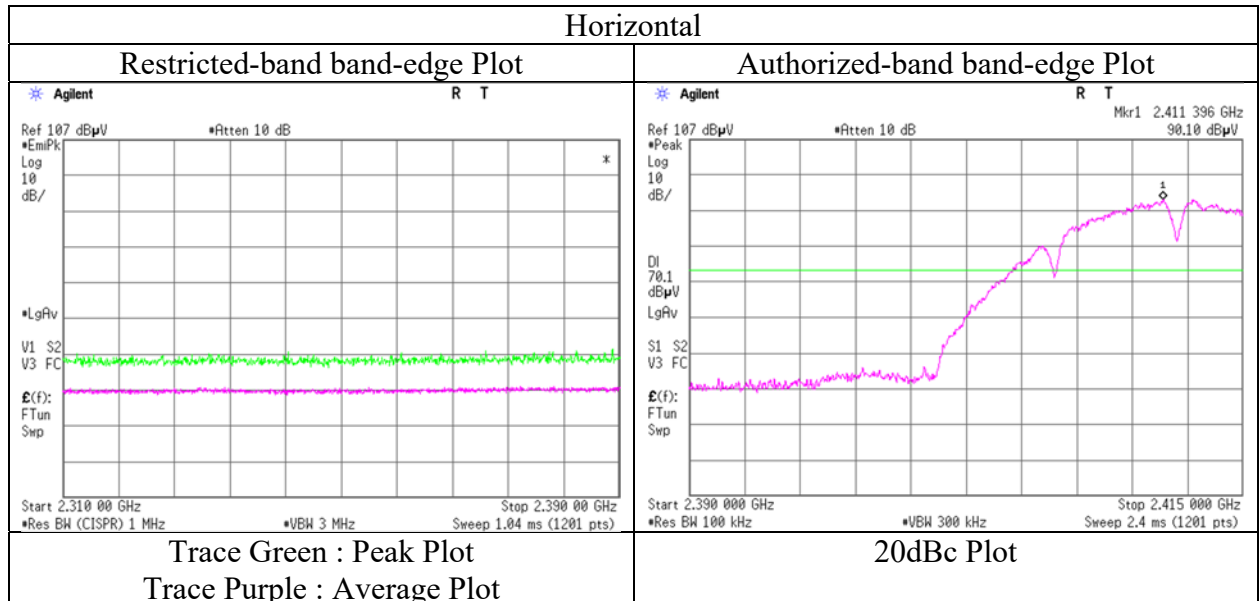
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13273483S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2020
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)
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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Radiated Spurious Emission

Report No.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 17, 2020	March 19, 2020	March 20, 2020
Temperature / Humidity	22 deg. C / 33 % RH	21 deg. C / 32 % RH	22 deg. C / 42 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Toshinori Yamada
	(1 GHz - 13 GHz)	(13 GHz - 18 GHz)	(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	50.27	31.70	6.50	42.93	2.24	47.78	73.9	26.1	197	57	
Hori.	7311.000	PK	48.16	37.36	8.00	43.48	2.24	52.28	73.9	21.6	150	0	
Hori.	9748.000	PK	47.68	39.31	9.16	42.98	2.24	55.41	73.9	18.4	150	0	
Hori.	19496.000	PK	43.91	40.47	13.79	48.04	-9.54	40.59	73.9	33.3	178	2	
Hori.	4874.000	AV	42.59	31.70	6.50	42.93	2.24	40.10	53.9	13.8	197	57	
Hori.	7311.000	AV	38.78	37.36	8.00	43.48	2.24	42.90	53.9	11.0	150	0	
Hori.	9748.000	AV	38.55	39.31	9.16	42.98	2.24	46.28	53.9	7.6	150	0	
Hori.	19496.000	AV	35.73	40.47	13.79	48.04	-9.54	32.41	53.9	21.5	178	2	
Vert.	3774.722	PK	53.43	29.91	5.85	42.27	2.24	49.16	73.9	24.7	100	201	
Vert.	4455.128	PK	52.95	30.81	6.24	42.83	2.24	49.41	73.9	24.4	102	191	
Vert.	4874.000	PK	49.37	31.70	6.50	42.93	2.24	46.88	73.9	27.0	356	34	
Vert.	7311.000	PK	47.95	37.36	8.00	43.48	2.24	52.07	73.9	21.8	150	0	
Vert.	9748.000	PK	47.62	39.31	9.16	42.98	2.24	55.35	73.9	18.5	150	0	
Vert.	19496.000	PK	47.87	40.47	13.79	48.04	-9.54	44.55	73.9	29.3	163	357	
Vert.	3774.722	AV	49.31	29.91	5.85	42.27	2.24	45.04	53.9	8.8	100	201	
Vert.	4455.128	AV	47.63	30.81	6.24	42.83	2.24	44.09	53.9	9.8	102	191	
Vert.	4874.000	AV	40.59	31.70	6.50	42.93	2.24	38.10	53.9	15.8	356	34	
Vert.	7311.000	AV	38.81	37.36	8.00	43.48	2.24	42.93	53.9	10.9	150	0	
Vert.	9748.000	AV	38.84	39.31	9.16	42.98	2.24	46.57	53.9	7.3	150	0	
Vert.	19496.000	AV	42.96	40.47	13.79	48.04	-9.54	39.64	53.9	14.2	163	357	

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

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Radiated Spurious Emission

Report No.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 17, 2020	March 19, 2020	March 20, 2020
Temperature / Humidity	22 deg. C / 33 % RH	21 deg. C / 32 % RH	22 deg. C / 42 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Toshinori Yamada
	(1 GHz - 13 GHz)	(13 GHz - 18 GHz)	(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	49.01	28.24	14.20	41.69	2.24	52.00	73.9	21.9	361	318	
Hori.	4924.000	PK	51.81	31.82	6.52	42.94	2.24	49.45	73.9	24.4	284	326	
Hori.	7386.000	PK	48.19	37.49	8.05	43.55	2.24	52.42	73.9	21.4	150	0	
Hori.	9848.000	PK	47.62	39.33	9.21	42.87	2.24	55.53	73.9	18.3	150	0	
Hori.	19696.000	PK	43.64	40.44	13.88	47.77	-9.54	40.65	73.9	33.2	163	8	
Hori.	2483.500	AV	39.38	28.24	14.20	41.69	2.24	42.37	53.9	11.5	361	318	
Hori.	4924.000	AV	44.92	31.82	6.52	42.94	2.24	42.56	53.9	11.3	284	326	
Hori.	7386.000	AV	39.20	37.49	8.05	43.55	2.24	43.43	53.9	10.4	150	0	
Hori.	9848.000	AV	39.50	39.33	9.21	42.87	2.24	47.41	53.9	6.4	150	0	
Hori.	19696.000	AV	36.21	40.44	13.88	47.77	-9.54	33.22	53.9	20.6	163	8	
Vert.	2483.500	PK	48.52	28.24	14.20	41.69	2.24	51.51	73.9	22.3	303	18	
Vert.	3775.149	PK	54.81	29.92	5.85	42.27	2.24	50.55	73.9	23.3	103	202	
Vert.	4455.057	PK	52.43	30.81	6.24	42.83	2.24	48.89	73.9	25.0	192	197	
Vert.	4924.000	PK	48.70	31.82	6.52	42.94	2.24	46.34	73.9	27.5	145	18	
Vert.	7386.000	PK	47.71	37.49	8.05	43.55	2.24	51.94	73.9	21.9	150	0	
Vert.	9848.000	PK	48.29	39.33	9.21	42.87	2.24	56.20	73.9	17.7	150	0	
Vert.	19696.000	PK	48.47	40.44	13.88	47.77	-9.54	45.48	73.9	28.4	163	358	
Vert.	2483.500	AV	38.74	28.24	14.20	41.69	2.24	41.73	53.9	12.1	303	18	
Vert.	3775.149	AV	49.49	29.92	5.85	42.27	2.24	45.23	53.9	8.6	103	202	
Vert.	4455.057	AV	48.13	30.81	6.24	42.83	2.24	44.59	53.9	9.3	192	197	
Vert.	4924.000	AV	41.22	31.82	6.52	42.94	2.24	38.86	53.9	15.0	145	18	
Vert.	7386.000	AV	39.13	37.49	8.05	43.55	2.24	43.36	53.9	10.5	150	0	
Vert.	9848.000	AV	39.09	39.33	9.21	42.87	2.24	47.00	53.9	6.9	150	0	
Vert.	19696.000	AV	44.46	40.44	13.88	47.77	-9.54	41.47	53.9	12.4	163	358	

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

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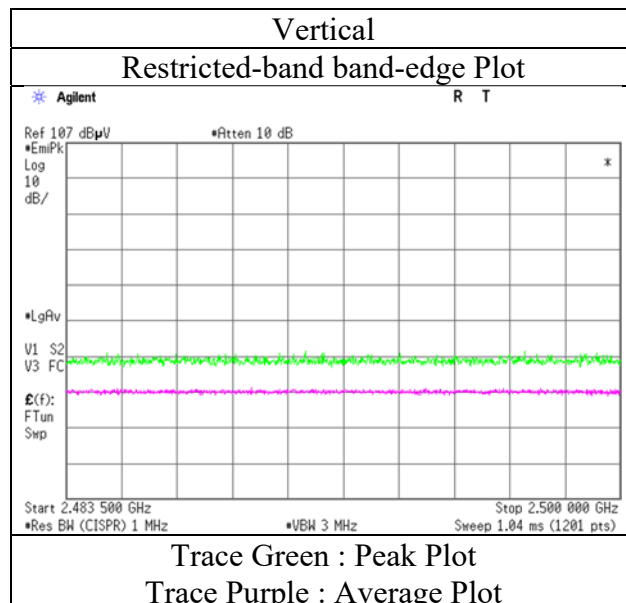
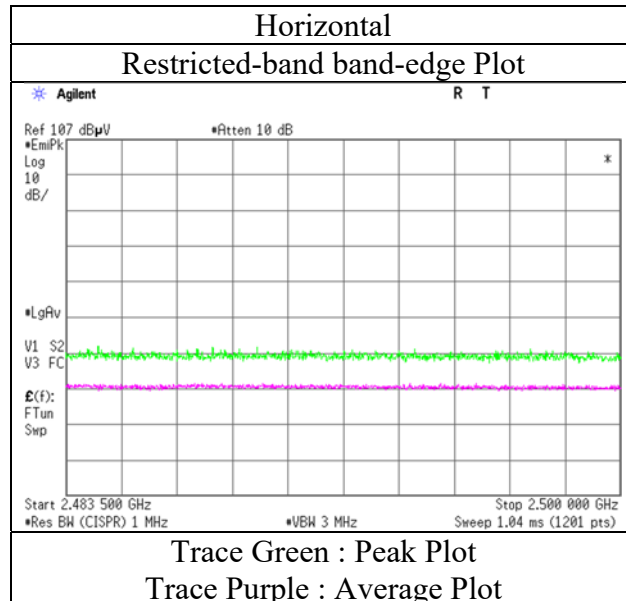
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13273483S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2020
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)
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.

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Radiated Spurious Emission

Report No.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 17, 2020	March 19, 2020	March 20, 2020
Temperature / Humidity	22 deg. C / 33 % RH	21 deg. C / 32 % RH	22 deg. C / 42 % RH
Engineer	Takahiro Kawakami (1 GHz - 2.8 GHz)	Takahiro Kawakami (2.8 GHz - 18 GHz)	Toshinori Yamada (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	50.48	28.33	14.11	41.66	2.24	53.50	73.9	20.4	331	338	
Hori.	4824.000	PK	48.80	31.64	6.42	42.93	2.24	46.17	73.9	27.7	349	348	
Hori.	7236.000	PK	49.22	37.25	7.86	43.41	2.24	53.16	73.9	20.7	150	0	
Hori.	9648.000	PK	50.05	38.97	9.04	43.10	2.24	57.20	73.9	16.7	150	0	
Hori.	19296.000	PK	43.44	40.45	13.74	48.20	-9.54	39.89	73.9	34.0	163	355	
Hori.	2390.000	AV	39.59	28.33	14.11	41.66	2.24	42.61	53.9	11.2	331	338	
Hori.	4824.000	AV	40.41	31.64	6.42	42.93	2.24	37.78	53.9	16.1	349	348	
Hori.	7236.000	AV	39.60	37.25	7.86	43.41	2.24	43.54	53.9	10.3	150	0	
Hori.	9648.000	AV	39.98	38.97	9.04	43.10	2.24	47.13	53.9	6.7	150	0	
Hori.	19296.000	AV	35.79	40.45	13.74	48.20	-9.54	32.24	53.9	21.6	163	355	
Vert.	2390.000	PK	49.73	28.33	14.11	41.66	2.24	52.75	73.9	21.1	244	18	
Vert.	3774.703	PK	53.65	29.91	5.80	42.27	2.24	49.33	73.9	24.5	108	194	
Vert.	4455.126	PK	52.81	30.81	6.19	42.83	2.24	49.22	73.9	24.6	144	189	
Vert.	4824.000	PK	48.83	31.64	6.42	42.93	2.24	46.20	73.9	27.7	369	114	
Vert.	7236.000	PK	48.84	37.25	7.86	43.41	2.24	52.78	73.9	21.1	150	0	
Vert.	9648.000	PK	49.41	38.97	9.04	43.10	2.24	56.56	73.9	17.3	150	0	
Vert.	19296.000	PK	47.59	40.45	13.74	48.20	-9.54	44.04	73.9	29.8	163	357	
Vert.	2390.000	AV	39.67	28.33	14.11	41.66	2.24	42.69	53.9	11.2	244	18	
Vert.	3774.703	AV	49.27	29.91	5.80	42.27	2.24	44.95	53.9	8.9	108	194	
Vert.	4455.126	AV	47.61	30.81	6.19	42.83	2.24	44.02	53.9	9.8	144	189	
Vert.	4824.000	AV	39.42	31.64	6.42	42.93	2.24	36.79	53.9	17.1	369	114	
Vert.	7236.000	AV	39.69	37.25	7.86	43.41	2.24	43.63	53.9	10.2	150	0	
Vert.	9648.000	AV	40.02	38.97	9.04	43.10	2.24	47.17	53.9	6.7	150	0	
Vert.	19296.000	AV	42.83	40.45	13.74	48.20	-9.54	39.28	53.9	14.6	163	357	

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 - 26.5 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	87.21	28.29	14.12	41.67	2.24	90.19	-	-	Carrier
Hori.	2400.000	PK	52.60	28.31	14.11	41.67	2.24	55.59	70.19	14.6	
Vert.	2412.000	PK	87.72	28.29	14.12	41.67	2.24	90.70	-	-	Carrier
Vert.	2400.000	PK	52.05	28.31	14.11	41.67	2.24	55.04	70.70	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 (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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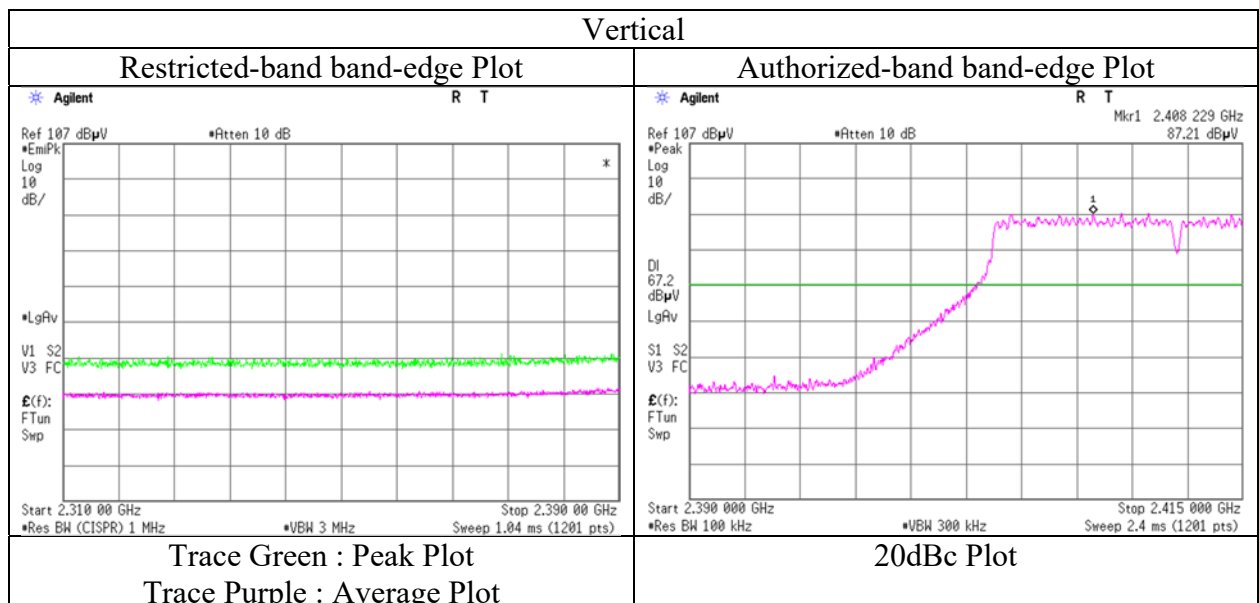
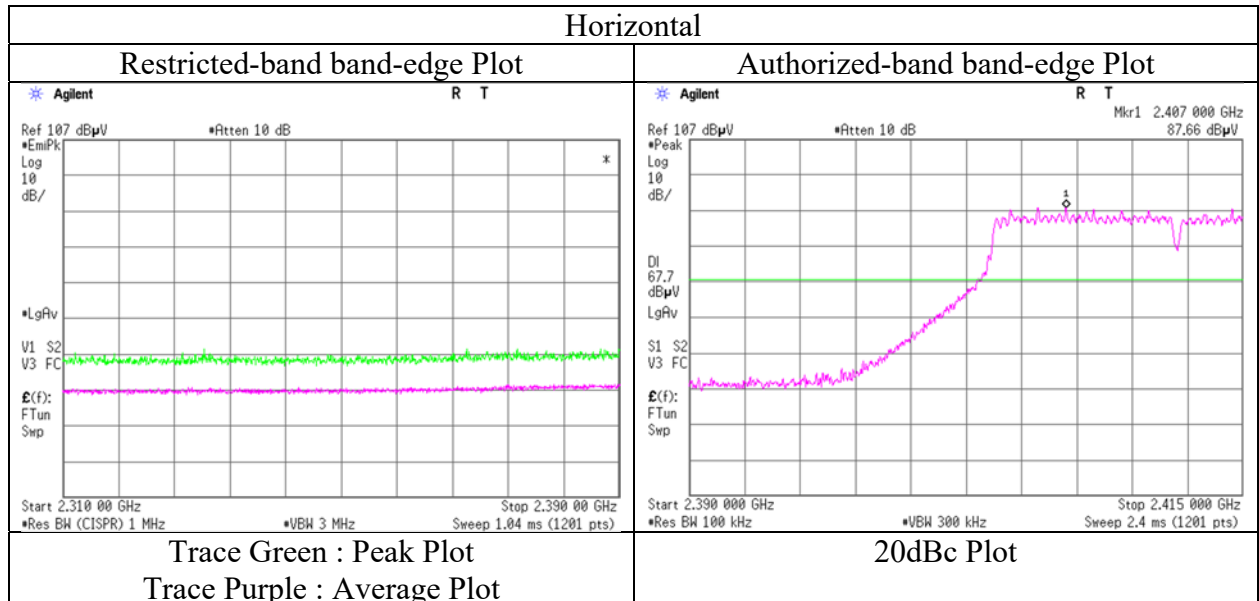
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13273483S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2020
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)
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. 13273483S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 3 3
Date March 17, 2020 March 19, 2020 March 20, 2020
Temperature / Humidity 22 deg. C / 33 % RH 21 deg. C / 32 % RH 22 deg. C / 42 % RH
Engineer Takahiro Kawakami Takahiro Kawakami Toshinori Yamada
(1 GHz - 2.8 GHz) (2.8 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	49.36	31.70	6.45	42.93	2.24	46.82	73.9	27.0	400	0	
Hori.	7311.000	PK	48.53	37.36	7.90	43.48	2.24	52.55	73.9	21.3	150	0	
Hori.	9748.000	PK	48.62	39.31	9.08	42.98	2.24	56.27	73.9	17.6	150	0	
Hori.	19496.000	PK	44.02	40.47	13.79	48.04	-9.54	40.70	73.9	33.2	162	336	
Hori.	4874.000	AV	39.92	31.70	6.45	42.93	2.24	37.38	53.9	16.5	400	0	
Hori.	7311.000	AV	38.98	37.36	7.90	43.48	2.24	43.00	53.9	10.9	150	0	
Hori.	9748.000	AV	39.30	39.31	9.08	42.98	2.24	46.95	53.9	6.9	150	0	
Hori.	19496.000	AV	36.10	40.47	13.79	48.04	-9.54	32.78	53.9	21.1	162	336	
Vert.	3774.666	PK	53.97	29.91	5.80	42.27	2.24	49.65	73.9	24.2	115	195	
Vert.	4455.102	PK	52.82	30.81	6.19	42.83	2.24	49.23	73.9	24.6	104	194	
Vert.	4874.000	PK	50.36	31.70	6.45	42.93	2.24	47.82	73.9	26.0	397	113	
Vert.	7311.000	PK	48.10	37.36	7.90	43.48	2.24	52.12	73.9	21.7	150	0	
Vert.	9748.000	PK	47.87	39.31	9.08	42.98	2.24	55.52	73.9	18.3	150	0	
Vert.	19496.000	PK	47.65	40.47	13.79	48.04	-9.54	44.33	73.9	29.5	162	355	
Vert.	3774.666	AV	49.01	29.91	5.80	42.27	2.24	44.69	53.9	9.2	115	195	
Vert.	4455.102	AV	48.31	30.81	6.19	42.83	2.24	44.72	53.9	9.1	104	194	
Vert.	4874.000	AV	39.72	31.70	6.45	42.93	2.24	37.18	53.9	16.7	397	113	
Vert.	7311.000	AV	39.32	37.36	7.90	43.48	2.24	43.34	53.9	10.5	150	0	
Vert.	9748.000	AV	39.37	39.31	9.08	42.98	2.24	47.02	53.9	6.8	150	0	
Vert.	19496.000	AV	43.21	40.47	13.79	48.04	-9.54	39.89	53.9	14.0	162	355	

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

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Radiated Spurious Emission

Report No.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 17, 2020	March 19, 2020	March 20, 2020
Temperature / Humidity	22 deg. C / 33 % RH	21 deg. C / 32 % RH	22 deg. C / 42 % RH
Engineer	Takahiro Kawakami (1 GHz - 2.8 GHz)	Takahiro Kawakami (2.8 GHz - 18 GHz)	Toshinori Yamada (18 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	50.72	28.24	14.20	41.69	2.24	53.71	73.9	20.1	256	334	
Hori.	4924.000	PK	49.09	31.82	6.47	42.94	2.24	46.68	73.9	27.2	396	357	
Hori.	7386.000	PK	48.92	37.49	7.95	43.55	2.24	53.05	73.9	20.8	150	0	
Hori.	9848.000	PK	48.82	39.33	9.13	42.87	2.24	56.65	73.9	17.2	150	0	
Hori.	19696.000	PK	44.17	40.44	13.88	47.77	-9.54	41.18	73.9	32.7	162	336	
Hori.	2483.500	AV	39.41	28.24	14.20	41.69	2.24	42.40	53.9	11.5	256	334	
Hori.	4924.000	AV	40.82	31.82	6.47	42.94	2.24	38.41	53.9	15.4	396	357	
Hori.	7386.000	AV	39.38	37.49	7.95	43.55	2.24	43.51	53.9	10.3	150	0	
Hori.	9848.000	AV	38.62	39.33	9.13	42.87	2.24	46.45	53.9	7.4	150	0	
Hori.	19696.000	AV	35.83	40.44	13.88	47.77	-9.54	32.84	53.9	21.0	162	336	
Vert.	2483.500	PK	49.52	28.24	14.20	41.69	2.24	52.51	73.9	21.3	400	241	
Vert.	3774.623	PK	54.52	29.91	5.80	42.27	2.24	50.20	73.9	23.7	119	194	
Vert.	4455.014	PK	52.81	30.81	6.19	42.83	2.24	49.22	73.9	24.6	104	186	
Vert.	4924.000	PK	48.69	31.82	6.47	42.94	2.24	46.28	73.9	27.6	145	62	
Vert.	7386.000	PK	48.28	37.49	7.95	43.55	2.24	52.41	73.9	21.4	150	0	
Vert.	9848.000	PK	47.60	39.33	9.13	42.87	2.24	55.43	73.9	18.4	150	0	
Vert.	19696.000	PK	48.87	40.44	13.88	47.77	-9.54	45.88	73.9	28.0	162	357	
Vert.	2483.500	AV	39.99	28.24	14.20	41.69	2.24	42.98	53.9	10.9	400	241	
Vert.	3774.623	AV	49.50	29.91	5.80	42.27	2.24	45.18	53.9	8.7	119	194	
Vert.	4455.014	AV	47.91	30.81	6.19	42.83	2.24	44.32	53.9	9.5	104	186	
Vert.	4924.000	AV	39.15	31.82	6.47	42.94	2.24	36.74	53.9	17.1	145	62	
Vert.	7386.000	AV	38.84	37.49	7.95	43.55	2.24	42.97	53.9	10.9	150	0	
Vert.	9848.000	AV	39.02	39.33	9.13	42.87	2.24	46.85	53.9	7.0	150	0	
Vert.	19696.000	AV	44.94	40.44	13.88	47.77	-9.54	41.95	53.9	11.9	162	357	

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

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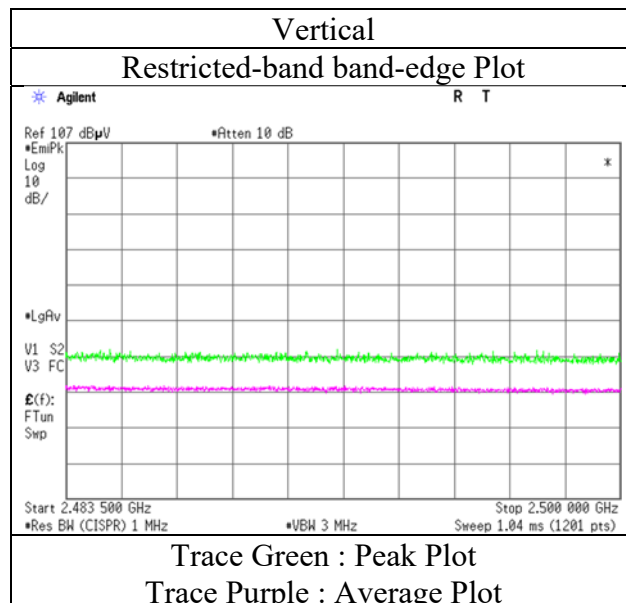
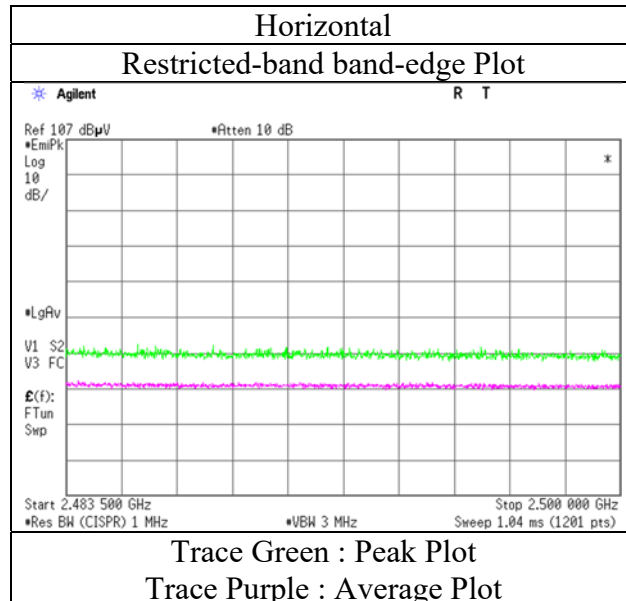
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13273483S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2020
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)
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.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 20, 2020	March 17, 2020	March 19, 2020
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 33 % RH	21 deg. C / 32 % RH
Engineer	Toshinori Yamada	Takahiro Kawakami	Takahiro Kawakami
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 18 GHz)
Mode	Tx 11n-20 2412 MHz [1/2]		

(* 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.	74.255	QP	36.98	6.16	7.16	32.15	0.00	18.15	40.0	21.8	252	249	
Hori.	148.492	QP	33.19	14.63	7.80	32.08	0.00	23.54	43.5	19.9	226	108	
Hori.	308.280	QP	41.60	13.63	8.83	31.96	0.00	32.10	46.0	13.9	100	129	
Hori.	370.881	QP	40.00	14.92	9.15	31.93	0.00	32.14	46.0	13.8	113	33	
Hori.	393.215	QP	36.64	15.26	9.23	31.93	0.00	29.20	46.0	16.8	100	346	
Hori.	444.080	QP	39.89	16.11	9.45	31.95	0.00	33.50	46.0	12.5	100	223	
Hori.	491.511	QP	36.88	17.36	9.59	31.92	0.00	31.91	46.0	14.0	100	66	
Hori.	519.234	QP	35.75	17.43	9.70	31.95	0.00	30.93	46.0	15.0	100	144	
Hori.	629.109	QP	34.12	19.24	10.09	31.94	0.00	31.51	46.0	14.4	175	219	
Hori.	666.113	QP	37.72	19.24	10.23	31.93	0.00	35.26	46.0	10.7	100	60	
Hori.	741.757	QP	38.50	19.85	10.50	31.76	0.00	37.09	46.0	8.9	156	355	
Hori.	816.729	QP	31.27	20.42	10.76	31.55	0.00	30.90	46.0	15.1	143	216	
Hori.	888.974	QP	36.22	21.60	10.97	31.11	0.00	37.68	46.0	8.3	104	162	
Hori.	2390.000	PK	49.65	28.33	14.11	41.66	2.24	52.67	73.9	21.2	341	340	
Hori.	4824.000	PK	49.21	31.64	6.42	42.93	2.24	46.58	73.9	27.3	391	357	
Hori.	7236.000	PK	49.09	37.25	7.86	43.41	2.24	53.03	73.9	20.8	150	0	
Hori.	9648.000	PK	49.11	38.97	9.04	43.10	2.24	56.26	73.9	17.6	150	0	
Hori.	19296.000	PK	35.92	40.45	13.74	48.20	-9.54	32.37	73.9	41.5	162	28	
Vert.	74.179	QP	42.91	6.16	7.16	32.15	0.00	24.08	40.0	15.9	146	223	
Vert.	148.495	QP	36.20	14.63	7.80	32.08	0.00	26.55	43.5	16.9	100	185	
Vert.	666.124	QP	36.43	19.24	10.23	31.93	0.00	33.97	46.0	12.0	146	2	
Vert.	693.612	QP	35.38	19.27	10.34	31.90	0.00	33.09	46.0	12.9	104	178	
Vert.	741.758	QP	38.60	19.85	10.50	31.76	0.00	37.19	46.0	8.8	131	342	
Vert.	755.997	QP	33.56	19.87	10.56	31.72	0.00	32.27	46.0	13.7	100	190	
Vert.	816.731	QP	32.79	20.42	10.76	31.55	0.00	32.42	46.0	13.5	100	313	
Vert.	888.999	QP	37.63	21.61	10.97	31.11	0.00	39.10	46.0	6.9	165	197	
Vert.	924.816	QP	30.85	21.70	11.08	30.85	0.00	32.78	46.0	13.2	100	331	
Vert.	2390.000	PK	49.52	28.33	14.11	41.66	2.24	52.54	73.9	21.3	144	18	
Vert.	3774.622	PK	53.96	29.91	5.80	42.27	2.24	49.64	73.9	24.2	108	193	
Vert.	4455.067	PK	53.64	30.81	6.19	42.83	2.24	50.05	73.9	23.8	119	192	
Vert.	4824.000	PK	48.40	31.64	6.42	42.93	2.24	45.77	73.9	28.1	373	90	
Vert.	7236.000	PK	48.75	37.25	7.86	43.41	2.24	52.69	73.9	21.2	150	0	
Vert.	9648.000	PK	49.51	38.97	9.04	43.10	2.24	56.66	73.9	17.2	150	0	
Vert.	19296.000	PK	47.40	40.45	13.74	48.20	-9.54	43.85	73.9	30.0	163	358	
Vert.	3774.622	AV	48.93	29.91	5.80	42.27	2.24	44.61	53.9	9.2	108	193	
Vert.	4455.067	AV	48.24	30.81	6.19	42.83	2.24	44.65	53.9	9.2	119	192	

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

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Radiated Spurious Emission

Report No.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 20, 2020	March 17, 2020	March 19, 2020
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 33 % RH	21 deg. C / 32 % RH
Engineer	Toshinori Yamada	Takahiro Kawakami	Takahiro Kawakami
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 18 GHz)
Mode	Tx 11n-20 2412 MHz [2/2]		

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	40.22	28.33	14.11	41.66	0.41	2.24	43.65	53.9	10.2	*1)
Hori.	4824.000	AV	40.35	31.64	6.42	42.93	0.41	2.24	38.13	53.9	15.7	
Hori.	7236.000	AV	39.76	37.25	7.86	43.41	0.41	2.24	44.11	53.9	9.7	
Hori.	9648.000	AV	40.03	38.97	9.04	43.10	0.41	2.24	47.59	53.9	6.3	
Hori.	19296.000	AV	43.83	40.45	13.74	48.20	0.41	-9.54	40.69	53.9	13.2	
Vert.	2390.000	AV	39.23	28.33	14.11	41.66	0.41	2.24	42.66	53.9	11.2	*1)
Vert.	4824.000	AV	39.52	31.64	6.42	42.93	0.41	2.24	37.30	53.9	16.6	
Vert.	7236.000	AV	39.74	37.25	7.86	43.41	0.41	2.24	44.09	53.9	9.8	
Vert.	9648.000	AV	40.10	38.97	9.04	43.10	0.41	2.24	47.66	53.9	6.2	
Vert.	19296.000	AV	42.93	40.45	13.74	48.20	0.41	-9.54	39.79	53.9	14.1	

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 - 26.5 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	87.05	28.29	14.12	41.67	2.24	90.03	-	-	Carrier
Hori.	2400.000	PK	54.18	28.31	14.11	41.67	2.24	57.17	70.03	12.8	
Vert.	2412.000	PK	87.54	28.29	14.12	41.67	2.24	90.52	-	-	Carrier
Vert.	2400.000	PK	53.20	28.31	14.11	41.67	2.24	56.19	70.52	14.3	

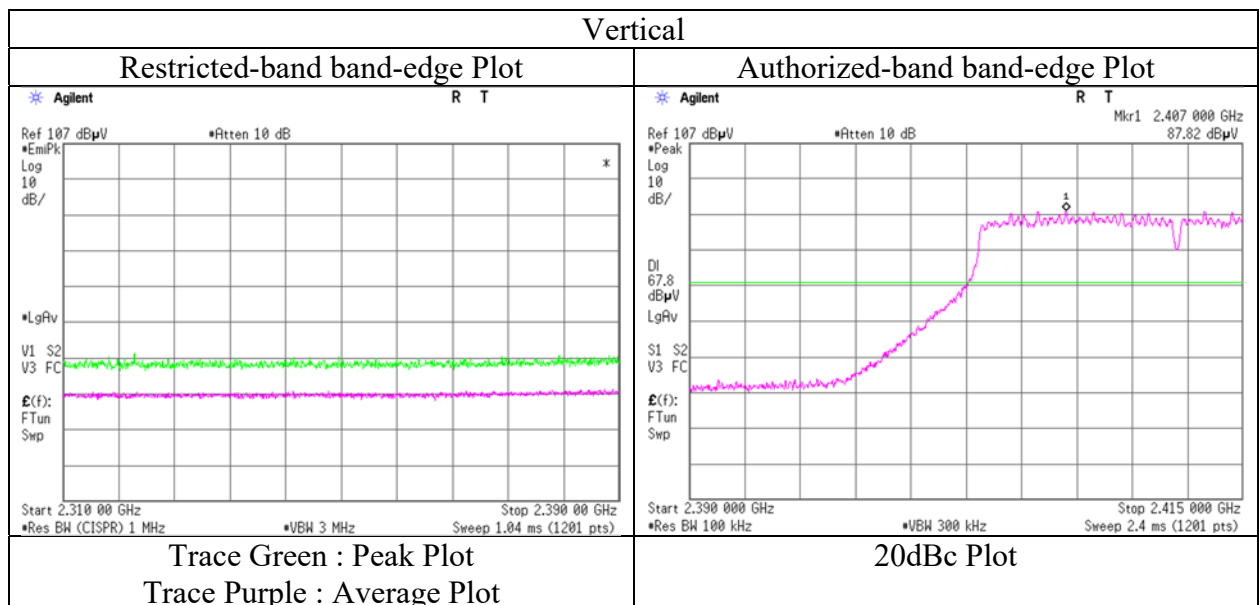
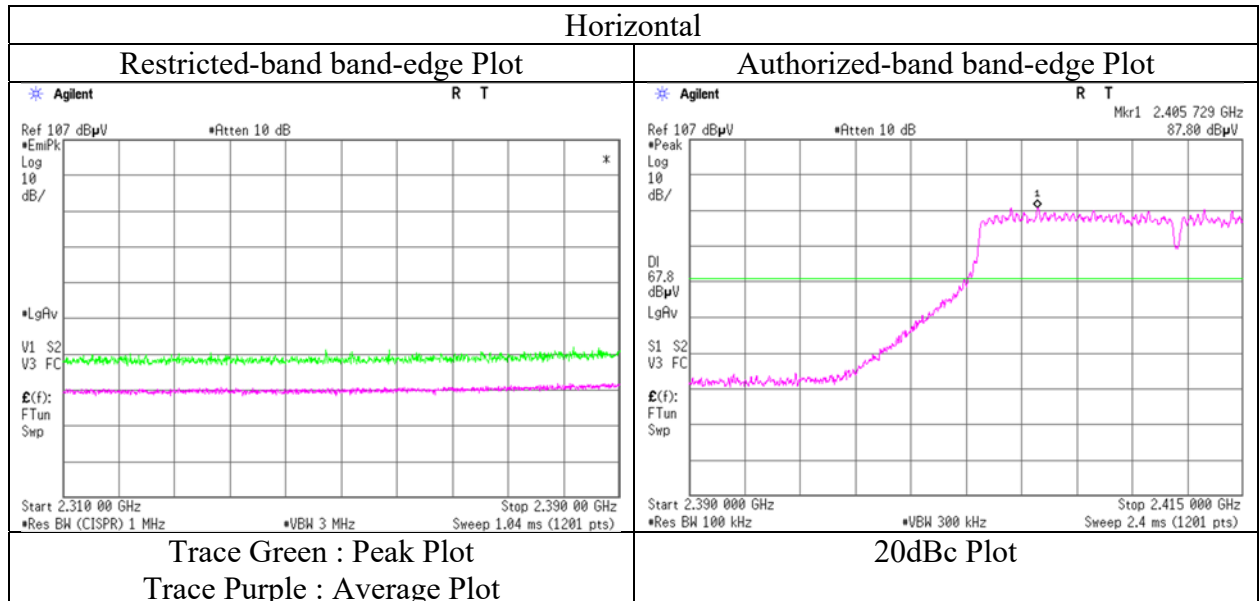
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

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

13 GHz - 26.5 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.	13273483S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2020
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)
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. 13273483S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3 3 3
Date March 17, 2020 March 19, 2020 March 20, 2020
Temperature / Humidity 22 deg. C / 33 % RH 21 deg. C / 32 % RH 22 deg. C / 42 % RH
Engineer Takahiro Kawakami Takahiro Kawakami Toshinori Yamada
(1 GHz - 2.8 GHz) (2.8 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	48.69	31.70	6.45	42.93	2.24	46.15	73.9	27.7	400	0	
Hori.	7311.000	PK	48.29	37.36	7.90	43.48	2.24	52.31	73.9	21.5	150	0	
Hori.	9748.000	PK	47.79	39.31	9.08	42.98	2.24	55.44	73.9	18.4	150	0	
Vert.	3774.706	PK	53.49	29.91	5.80	42.27	2.24	49.17	73.9	24.7	116	194	
Vert.	4455.097	PK	52.98	30.81	6.19	42.83	2.24	49.39	73.9	24.5	105	194	
Vert.	4874.000	PK	47.77	31.70	6.45	42.93	2.24	45.23	73.9	28.6	398	66	
Vert.	7311.000	PK	48.26	37.36	7.90	43.48	2.24	52.28	73.9	21.6	150	0	
Vert.	9748.000	PK	48.82	39.31	9.08	42.98	2.24	56.47	73.9	17.4	150	0	
Vert.	3774.706	AV	49.00	29.91	5.80	42.27	2.24	44.68	53.9	9.2	116	194	
Vert.	4455.097	AV	47.56	30.81	6.19	42.83	2.24	43.97	53.9	9.9	105	194	

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 - 26.5 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	39.70	31.70	6.45	42.93	0.41	2.24	37.57	53.9	16.3	
Hori.	7311.000	AV	39.14	37.36	7.90	43.48	0.41	2.24	43.57	53.9	10.3	
Hori.	9748.000	AV	39.33	39.31	9.08	42.98	0.41	2.24	47.39	53.9	6.5	
Vert.	4874.000	AV	39.25	31.70	6.45	42.93	0.41	2.24	37.12	53.9	16.7	
Vert.	7311.000	AV	39.21	37.36	7.90	43.48	0.41	2.24	43.64	53.9	10.2	
Vert.	9748.000	AV	39.54	39.31	9.08	42.98	0.41	2.24	47.60	53.9	6.3	

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 - 26.5 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.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 17, 2020	March 19, 2020	March 20, 2020
Temperature / Humidity	22 deg. C / 33 % RH	21 deg. C / 32 % RH	22 deg. C / 42 % RH
Engineer	Takahiro Kawakami (1 GHz - 2.8 GHz)	Takahiro Kawakami (2.8 GHz - 18 GHz)	Toshinori Yamada (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	52.02	28.24	14.20	41.69	2.24	55.01	73.9	18.8	359	329	
Hori.	4924.000	PK	48.71	31.82	6.47	42.94	2.24	46.30	73.9	27.6	390	3	
Hori.	7386.000	PK	47.74	37.49	7.95	43.55	2.24	51.87	73.9	22.0	150	0	
Hori.	9848.000	PK	47.32	39.33	9.13	42.87	2.24	55.15	73.9	18.7	150	0	
Vert.	2483.500	PK	52.26	28.24	14.20	41.69	2.24	55.25	73.9	18.6	400	246	
Vert.	3774.703	PK	54.41	29.91	5.80	42.27	2.24	50.09	73.9	23.8	117	195	
Vert.	4455.060	PK	53.55	30.81	6.19	42.83	2.24	49.96	73.9	23.9	120	192	
Vert.	4924.000	PK	48.00	31.82	6.47	42.94	2.24	45.59	73.9	28.3	353	119	
Vert.	7386.000	PK	48.59	37.49	7.95	43.55	2.24	52.72	73.9	21.1	150	0	
Vert.	9848.000	PK	49.05	39.33	9.13	42.87	2.24	56.88	73.9	17.0	150	0	
Vert.	3774.703	AV	48.88	29.91	5.80	42.27	2.24	44.56	53.9	9.3	117	195	
Vert.	4455.060	AV	47.98	30.81	6.19	42.83	2.24	44.39	53.9	9.5	120	192	

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 - 26.5 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	39.34	28.24	14.20	41.69	0.41	2.24	42.74	53.9	11.1	*1)
Hori.	4924.000	AV	40.59	31.82	6.47	42.94	0.41	2.24	38.59	53.9	15.3	
Hori.	7386.000	AV	39.28	37.49	7.95	43.55	0.41	2.24	43.82	53.9	10.0	
Hori.	9848.000	AV	38.95	39.33	9.13	42.87	0.41	2.24	47.19	53.9	6.7	
Vert.	2483.500	AV	39.57	28.24	14.20	41.69	0.41	2.24	42.97	53.9	10.9	*1)
Vert.	4924.000	AV	39.31	31.82	6.47	42.94	0.41	2.24	37.31	53.9	16.5	
Vert.	7386.000	AV	39.17	37.49	7.95	43.55	0.41	2.24	43.71	53.9	10.1	
Vert.	9848.000	AV	38.83	39.33	9.13	42.87	0.41	2.24	47.07	53.9	6.8	

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 - 26.5 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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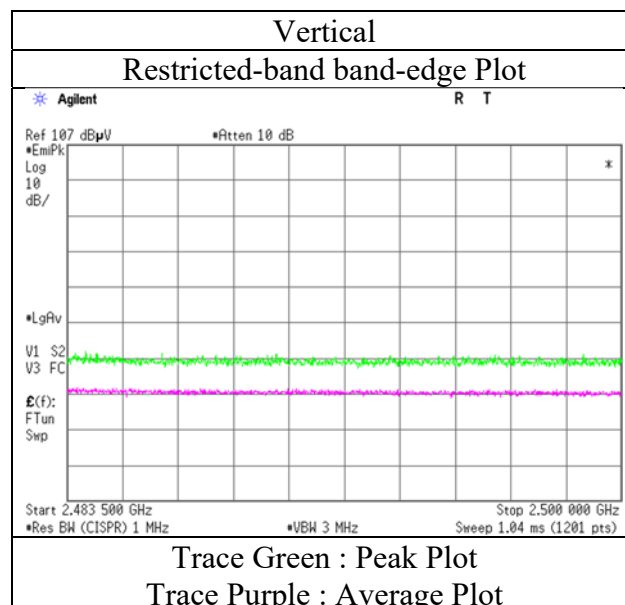
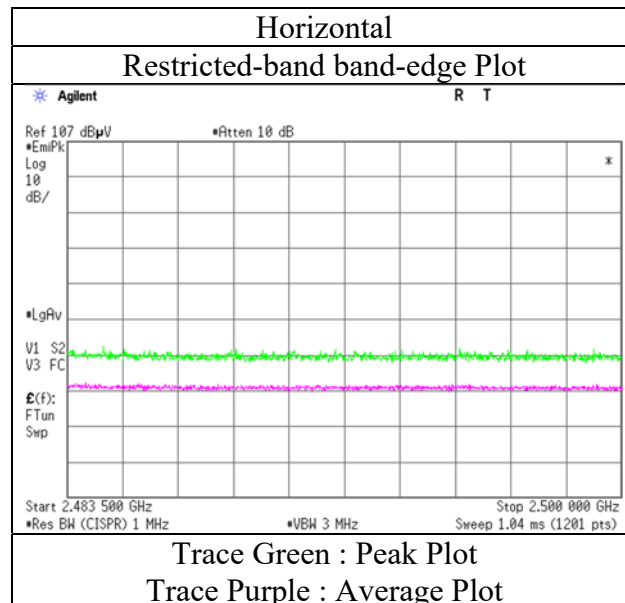
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13273483S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 17, 2020
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)
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.

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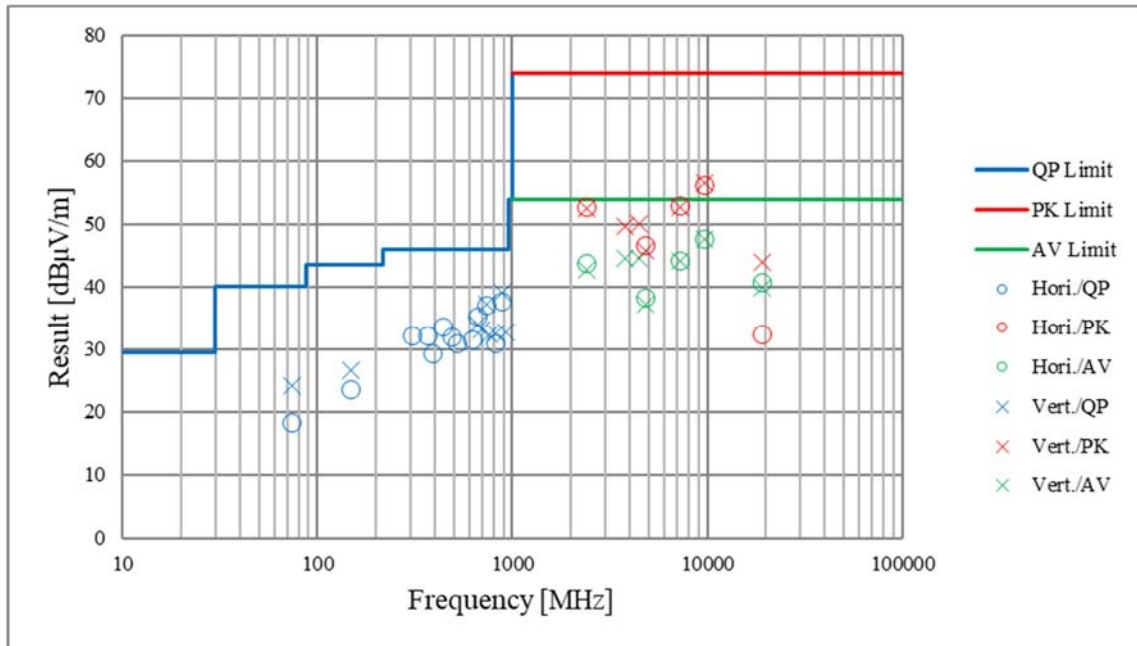
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Plot data, Worst case)

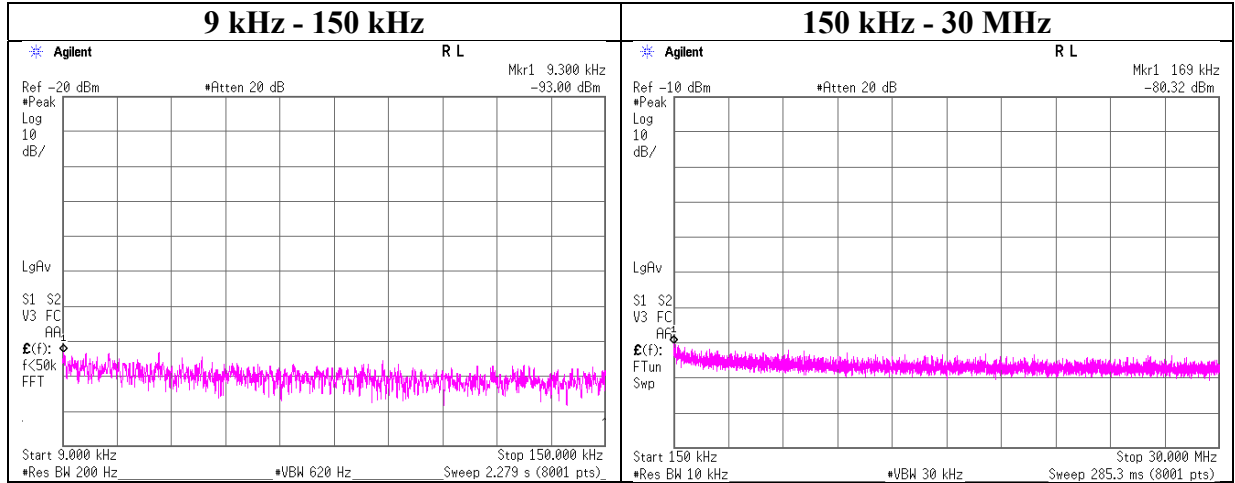
Report No.	13273483S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	March 20, 2020	March 17, 2020	March 19, 2020
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 33 % RH	21 deg. C / 32 % RH
Engineer	Toshinori Yamada	Takahiro Kawakami	Takahiro Kawakami
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 18 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. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
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
9.30	-93.0	0.01	10.1	2.0	1	-80.9	300	6.0	-19.6	48.2	67.8	
169.00	-80.3	0.01	10.1	2.0	1	-68.2	300	6.0	-6.9	23.0	29.9	

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

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

N: Number of output

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

Power Density

Report No. 13273483S-A-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 12, 2020
Temperature / Humidity 24 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx

11b

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-20.57	2.30	10.18	-8.09	8.00	16.09
2437	-20.76	2.31	10.18	-8.27	8.00	16.27
2462	-20.90	2.31	10.18	-8.41	8.00	16.41

11g

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-27.08	2.30	10.18	-14.60	8.00	22.60
2437	-27.39	2.31	10.18	-14.90	8.00	22.90
2462	-27.70	2.31	10.18	-15.21	8.00	23.21

11n-20

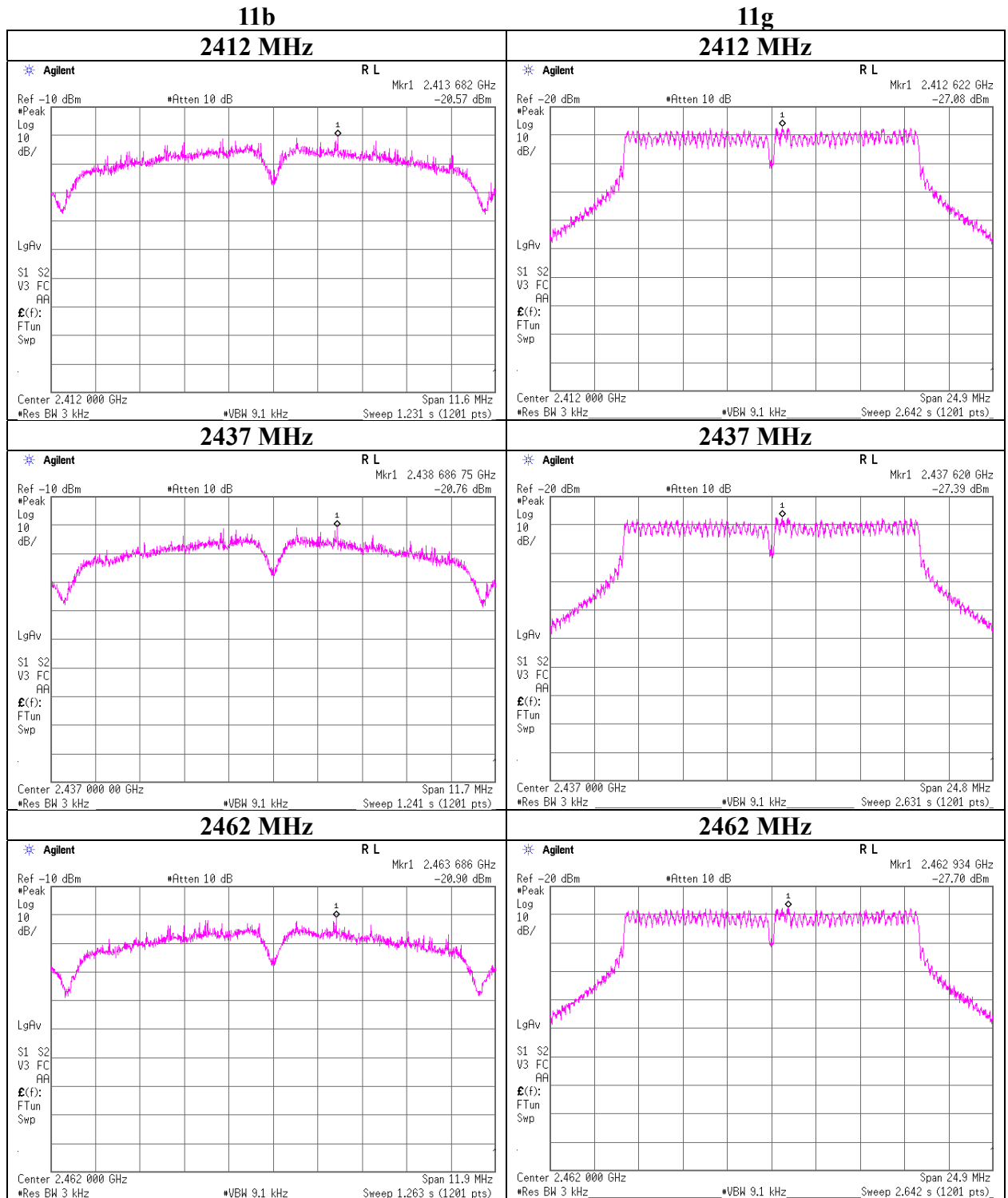
Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-26.77	2.30	10.18	-14.29	8.00	22.29
2437	-26.63	2.31	10.18	-14.14	8.00	22.14
2462	-26.32	2.31	10.18	-13.83	8.00	21.83

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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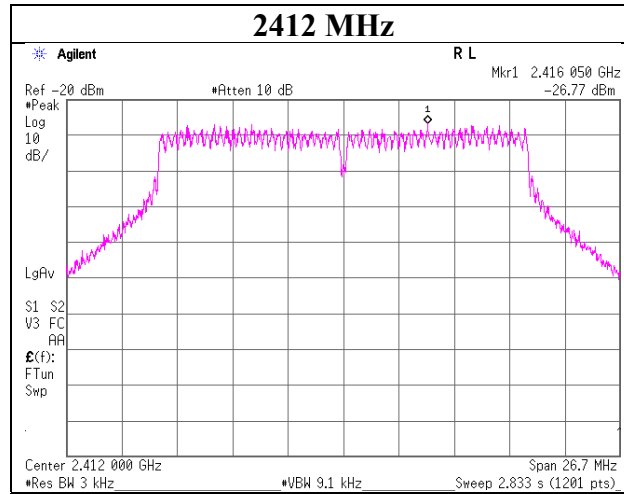
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

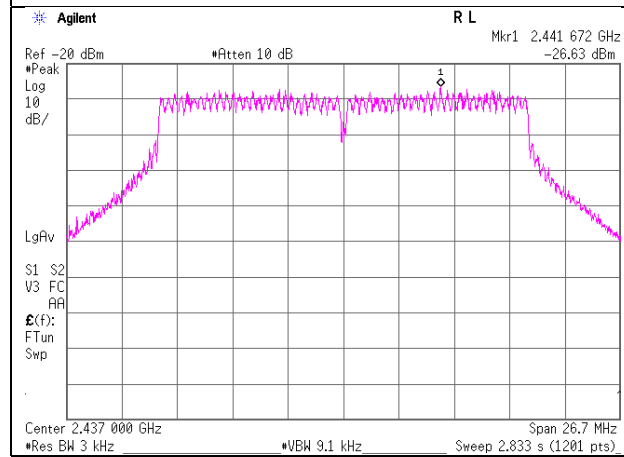
Power Density

11n-20

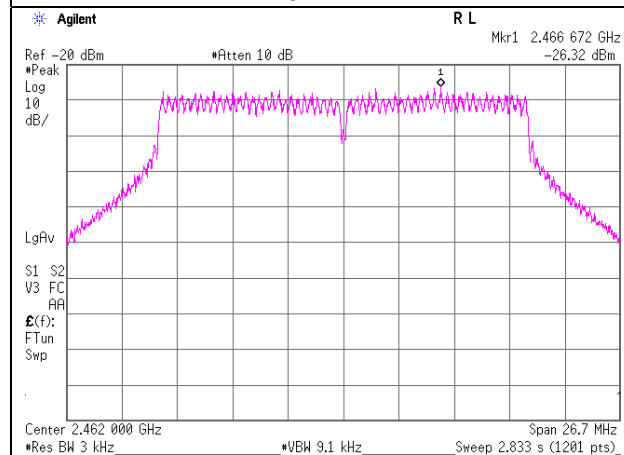
2412 MHz



2437 MHz



2462 MHz



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APPENDIX 2: Test instruments

Test equipment (1/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,M E,PE)	-	-	-
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2019/11/05	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2019/04/08	12
RE	SAEC-03(SVS WR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2019/05/03	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2020/02/19	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	2020/03/03	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 Mess - Elektronik	BBA9106	91032666	2019/05/07	12
RE	SCC-C1/C2/C3 /C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/TOYO	8D2W/12DSFA /141PE/141PE/141PE/141PE/NS 4906	-/0901-271(RF Selector)	2019/04/19	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2020/03/04	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-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-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2019/04/16	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-739	2019/06/26	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2019/06/26	12
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	VUSLP9111B	196	2019/05/07	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	STS-03	146210	Digital Hitester	Hioki	3805-50	80997823	2019/10/01	12

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Test equipment (2/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
AT	SPM-07	146247	Power Meter	Keysight Technologies Inc	8990B	MY5100272	2019/07/16	12
AT	SPSS-04	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2019/07/16	12
AT	SCC-G14	145175	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	2019/12/12	12
AT	SAT10-15	160493	Attenuator	Weinschel Corp.	54A-10	83406	2019/12/12	12
AT	SOS-19	175823	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/19	12
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
AT,RE	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2019/04/04	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