



RADIO TEST REPORT

Test Report No. : 13282400S-A-R1

Applicant : CASIO COMPUTER CO., LTD.
Type of EUT : RF Module
Model Number of EUT : GSW-H1000
FCC ID : BBQ-GSWH1000
Test regulation : FCC Part 15 Subpart C: 2020
*WLAN and Bluetooth Low Energy part
Test Result : Complied (Refer to SECTION 3.2)

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3. This sample tested is in compliance with the limits of the above regulation.
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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 13282400S-A. 13282400S-A is replaced with this report.

Date of test: April 20 to May 15, 2020

Representative test engineer:

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CERTIFICATE 1266.03

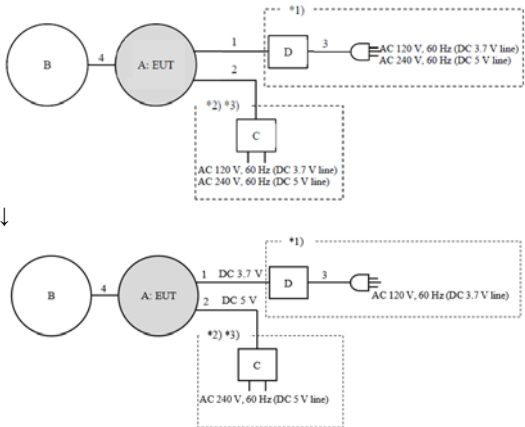
- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 13282400S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13282400S-A	May 29, 2020	-	-
1	13282400S-A-R1	June 12, 2020	P.1	Modification of remarks: *WLAN part → *WLAN and Bluetooth Low Energy part
			P.11	Correction of 4.2 Configuration and peripherals:  Correction of description *1) It is Open during Conducted Emission test with DC 5.0 V line. *2) It is Open during Radiated Emission test and Conducted Emission test with DC 3.7 V line. ↓ *1) Not used during Conducted Emission test with DC 5.0 V line. *2) Not used during Radiated Emission test and Conducted Emission test with DC 3.7 V line. Addition of remarks: *3) Used for other than Conducted emission test of DC 5.0 V line *4) Used for Conducted emission test of DC 5.0 V line

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	:	CASIO COMPUTER CO., LTD.
Address	:	2-1, Sakaecho 3 chome, Hamura-shi, Tokyo 205-8555 Japan
Telephone Number	:	+81-42-579-7282
Contact Person	:	Hiroaki Suzuki

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) other than the Receipt Date
 - 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	:	RF Module
Model Number	:	GSW-H1000
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 3.7 V typical (battery) (DC 3.5 V to 4.2 V) DC 5 V typical (Charging Pad)
Receipt Date (Information from the lab.)	:	April 14, 2020
Country of Mass-production	:	Japan, Thailand
Condition	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: GSW-H1000 (referred to as the EUT in this report) is a RF Module.

* GSW-H1000 has alternative name as S001.

Radio Specification

WLAN (IEEE802.11b/g/n-20)

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS, OFDM
Antenna type	:	Inverted F type
Antenna Gain	:	-3.7 dBi
Clock frequency (Maximum)	:	32.768 kHz

Bluetooth (Ver. 4.2 with EDR function)

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK) LE: GFSK
Antenna type	:	Inverted F type
Antenna Gain	:	-3.7 dBi
Clock frequency (Maximum)	:	32.768 kHz

*This test report applies for WLAN and Bluetooth Low Energy parts.

**Wireless LAN and Bluetooth and Bluetooth Low Energy do not transmit simultaneously.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on April 1, 2020 and effective June 1, 2020 except 15.258
* The revision does not affect the test result conducted before its effective date.

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	8.5 dB 11.43129 MHz, QP, N Tx 11g 2412 MHz (DC 5.0 V line)	Complied a)	-
6 dB 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 b)	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 c)	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 d)	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	2.1 dB 2390.000 MHz, AV, Hori. Tx 11g 2412 MHz	Complied# e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

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

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

Symbols:

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

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

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

FCC Part 15.31 (e)

The RF Module has its own regulator. The RF Module is constantly provided voltage through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The antenna is not removable from 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	- b)	Conducted
b) 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	-
	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 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.

SECTION 4: Operation of EUT during testing

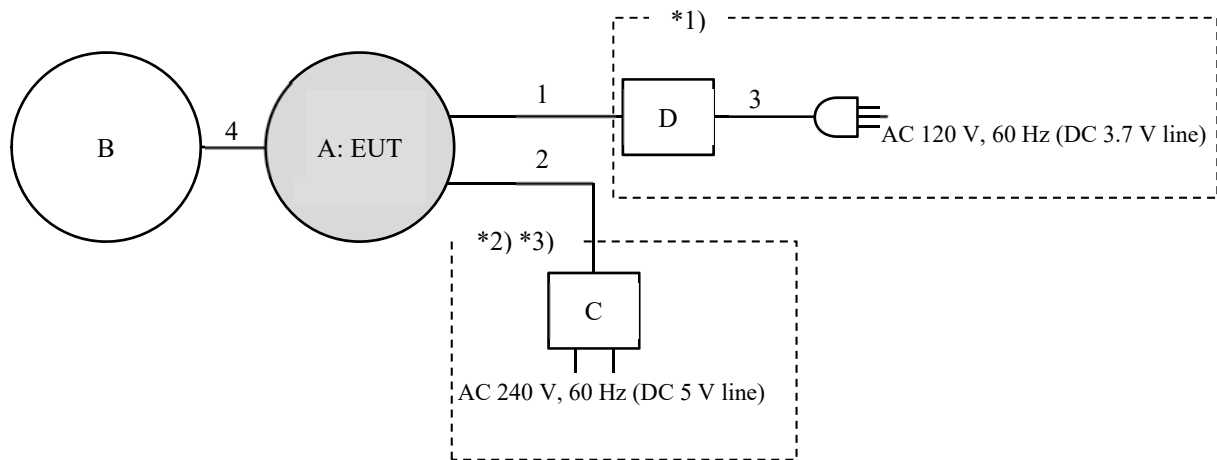
4.1 Operating Mode(s)

Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	9 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 1, PN9
Bluetooth(BT) Low Energy (LE)	Maximum Packet Size, 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: Fixed Software: GSW-H1000-Radio, ver1.0 (Date: March 9, 2020, 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
Conducted Emission, Conducted Spurious Emission, Radiated Spurious Emission (below 1 GHz)	Tx, 11g	2412 MHz
	Tx, BT LE	2402 MHz
		2440 MHz
		2480 MHz
Radiated Spurious Emission (above 1 GHz)	Tx, 11b	2412 MHz
	Tx, 11g	2437 MHz
	Tx, 11n-20	2462 MHz
	Tx, BT LE	2402 MHz
		2440 MHz
		2480 MHz
6 dB Bandwidth, Maximum Peak Output Power, Power Density, 99 % Occupied Bandwidth	Tx, 11b	2412 MHz
	Tx, 11g	2437 MHz
	Tx, 11n-20	2462 MHz
	Tx, BT LE	2402 MHz
		2440 MHz
		2480 MHz

4.2 Configuration and peripherals



*1) Not used during Conducted Emission test with DC 5.0 V line.

*2) Not used during Radiated Emission test and Conducted Emission test with DC 3.7 V line.

*3) Radiated emission has been tested with power supply of DC 3.7 V representatively. The RF part is constantly provided voltage through the regulator and it has been confirmed that the variation of power supply does not affect the test result.

*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with the following worst voltage as representative; AC 120 V (for DC 3.7 V line) and AC 240 V (for DC 5 V line).

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RF Module	GSW-H1000	54 *1) 55 *2)	CASIO COMPUTER CO., LTD.	EUT
B	LCD	-	-	CASIO COMPUTER CO., LTD.	-
C	AC Adapter	PSAA05A-050QL6	-	CASIO COMPUTER CO., LTD.	-
D	Power Supply (DC)	NL002383	PAN60-10A	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	DC Cable	0.1 + 2.0	Unshielded	Unshielded	-
2	USB Cable	0.4 *3)	Shielded	Shielded	-
		0.4 + 1.7 *4)	Shielded	Shielded	-
3	AC Cable	3.0	Unshielded	Unshielded	-
4	Signal	0.01	Unshielded	Unshielded	-

*3) Used for other than Conducted emission test of DC 5.0 V line

*4) Used for Conducted emission test of DC 5.0 V line

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SECTION 5: Conducted Emission

Test Procedure and conditions

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

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT itself (as a standalone equipment)

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via AC Adapter / DC power supply in a Shielded room.

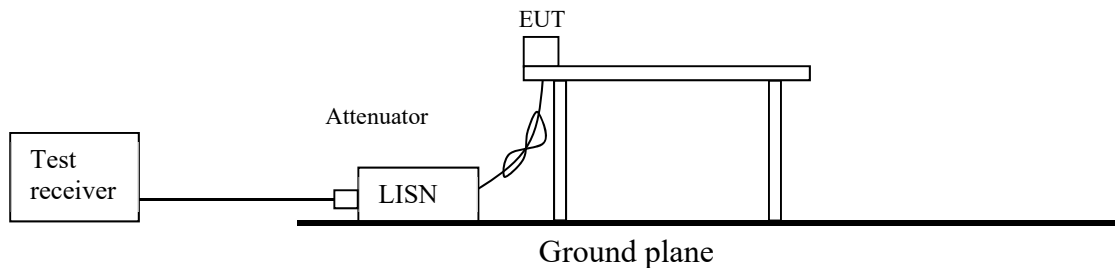
The EUT via AC Adapter / DC power supply was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 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.

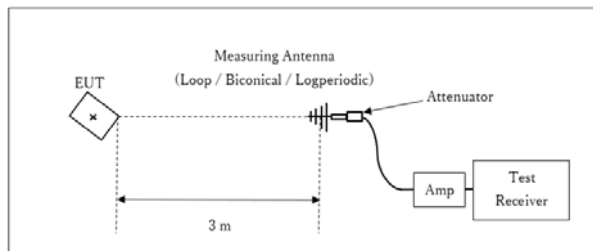
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	30 MHz to 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 2: Test Setup

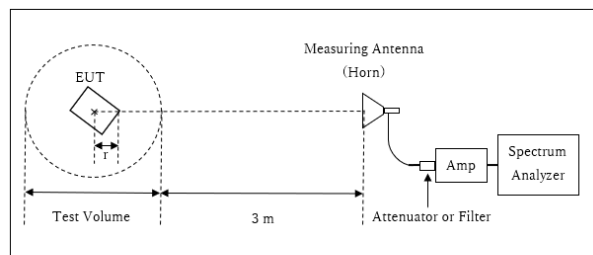
Below 1 GHz



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: $20 \times \log (3.96 \text{ m} / 3.0 \text{ m}) = 2.41 \text{ dB}$

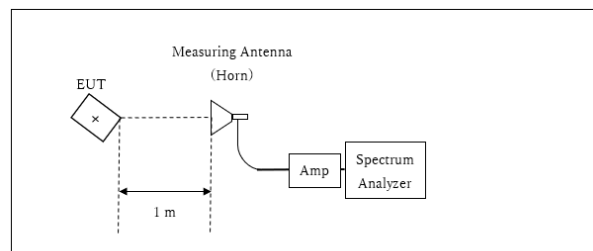
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.96 \text{ m}$

Test Volume : 2.0 m

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

$r = 0.04 \text{ m}$

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 each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Test Antenna	Frequency	Carrier	Spurious			
			30 MHz-1 GHz	1 GHz -13 GHz	13 GHz -18 GHz	18 GHz -26.5 GHz
Horizontal		X	Y	X	X	X
Vertical		Y	Y	Y	X	X

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 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6 dB Bandwidth	WLAN: 50 MHz BLE : 10 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 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)*5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.

*2) Reference data

*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".

*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.

(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

*5) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to $45.5 - 51.5 = -6.0$ dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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

Conducted Emission (DC 3.7 V line)

DATA OF CONDUCTED EMISSION TEST

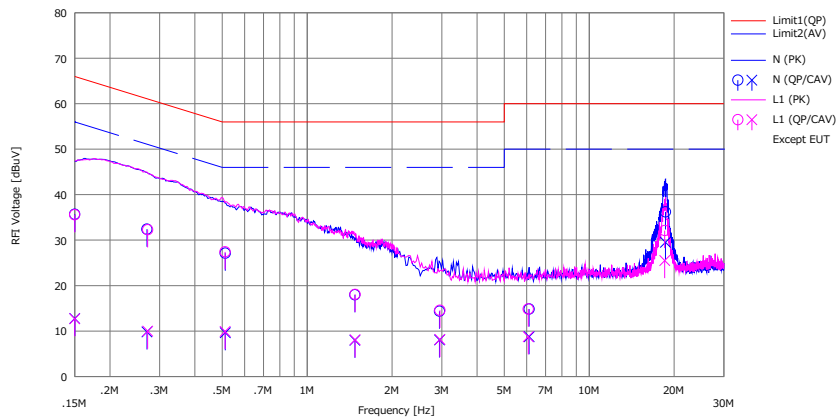
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/14

Mode : Tx_11g_2412 MHz

Power : AC 120 V / 60 Hz (EUT Input: DC 3.7 V)
Temp./Humi. : 21 deg.C / 43 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Hiromasa Sato



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		(QP) [dBuV]	(CAV) [dBuV]		(QP) [dBuV]	(CAV) [dBuV]	(QP) [dBuV]	(AV) [dBuV]	(QP) [dB]	(AV) [dB]		
1	0.15000	23.20	0.30	12.48	35.68	12.78	66.00	56.00	30.3	43.2	N	
2	0.27035	19.90	-2.70	12.49	32.39	9.79	61.11	51.11	28.7	41.3	N	
3	0.51252	14.60	-2.90	12.52	27.12	9.62	56.00	46.00	28.8	36.3	N	
4	1.47618	5.40	-4.60	12.57	17.97	7.97	56.00	46.00	38.0	38.0	N	
5	2.94683	1.70	-4.60	12.66	14.36	8.06	56.00	46.00	41.6	37.9	N	
6	6.12449	2.00	-4.10	12.83	14.83	8.73	60.00	50.00	45.1	41.2	N	
7	18.62396	22.90	16.20	13.31	36.21	29.51	60.00	50.00	23.7	20.4	N	
8	0.15000	23.10	0.20	12.48	35.58	12.68	66.00	56.00	30.4	43.3	L1	
9	0.27214	19.80	-2.50	12.49	32.29	9.99	61.05	51.05	28.7	41.0	L1	
10	0.51189	14.90	-2.60	12.52	27.42	9.92	56.00	46.00	28.5	36.0	L1	
11	1.47957	5.50	-4.50	12.57	18.07	8.07	56.00	46.00	37.9	37.9	L1	
12	2.95636	1.90	-4.50	12.66	14.56	8.16	56.00	46.00	41.4	37.8	L1	
13	6.07934	2.00	-4.10	12.83	14.83	8.73	60.00	50.00	45.1	41.2	L1	
14	18.52400	18.80	12.20	13.31	32.11	25.51	60.00	50.00	27.8	24.4	L1	

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

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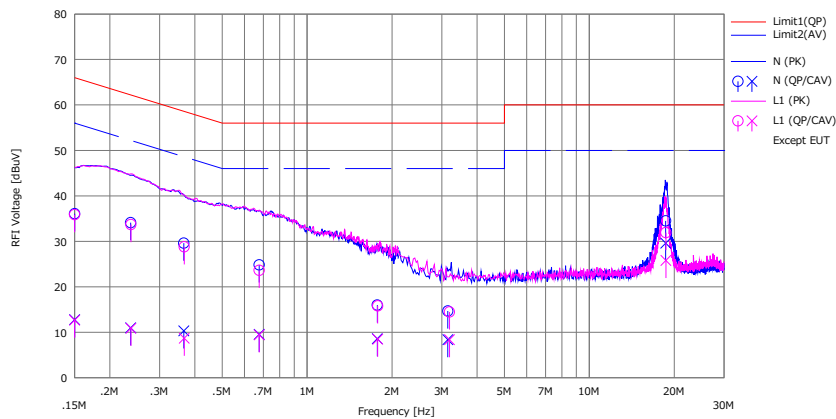
Conducted Emission (DC 3.7 V line)

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/15

Mode : Tx_BLE_2480 MHz
Power : AC 120 V / 60 Hz (EUT Input: DC 3.7 V)
Temp./Humi. : 21 deg.C / 43 %RH

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	23.60	0.30	12.48	36.08	12.78	66.00	56.00	29.9	43.2	N	
2	0.23708	21.60	-1.50	12.49	34.09	10.99	62.20	52.20	28.1	41.2	N	
3	0.36565	17.10	-2.20	12.50	29.60	10.30	58.60	48.60	29.0	38.3	N	
4	0.67666	12.30	-3.00	12.53	24.83	9.53	56.00	46.00	31.1	36.4	N	
5	1.77320	3.40	-4.00	12.59	15.99	8.59	56.00	46.00	40.0	37.4	N	
6	3.15259	2.00	-4.30	12.67	14.67	8.37	56.00	46.00	41.3	37.6	N	
7	18.65490	21.20	16.30	13.31	34.51	29.61	60.00	50.00	25.4	20.3	N	
8	0.15000	23.40	0.20	12.48	35.88	12.68	66.00	56.00	30.1	43.3	L1	
9	0.23744	21.20	-1.60	12.49	33.69	10.89	62.19	52.19	28.5	41.3	L1	
10	0.36683	16.30	-3.80	12.50	28.80	8.70	58.57	48.57	29.7	39.8	L1	
11	0.67647	11.10	-3.10	12.53	23.63	9.43	56.00	46.00	32.3	36.5	L1	
12	1.77874	3.20	-4.10	12.59	15.79	8.49	56.00	46.00	40.2	37.5	L1	
13	3.19635	1.80	-4.30	12.67	14.47	8.37	56.00	46.00	41.5	37.6	L1	
14	18.67490	18.60	12.50	13.31	31.91	25.81	60.00	50.00	28.0	24.1	L1	

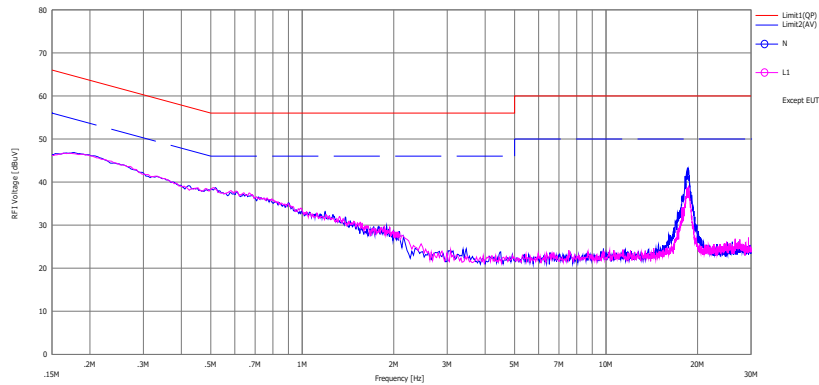
Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): SLS-02

Conducted Emission

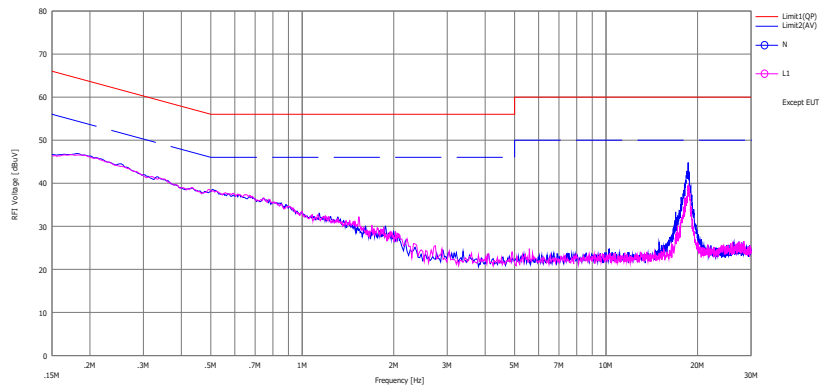
(DC 3.7 V line)

Report No. 13282400S-A-R1
Test place Shonan EMC Lab. No.3 Shielded room
Date May 14, 2020
Temperature / Humidity 21 deg. C / 43 % RH
Engineer Hiromasa Sato
Mode Tx BT LE

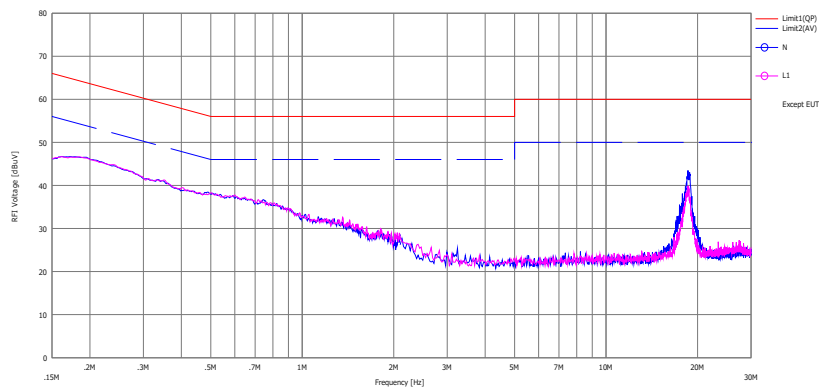
2402 MHz



2440 MHz



2480 MHz



Y scale [dBuV]

Chart — N — L

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Conducted Emission (DC 5.0 V line)

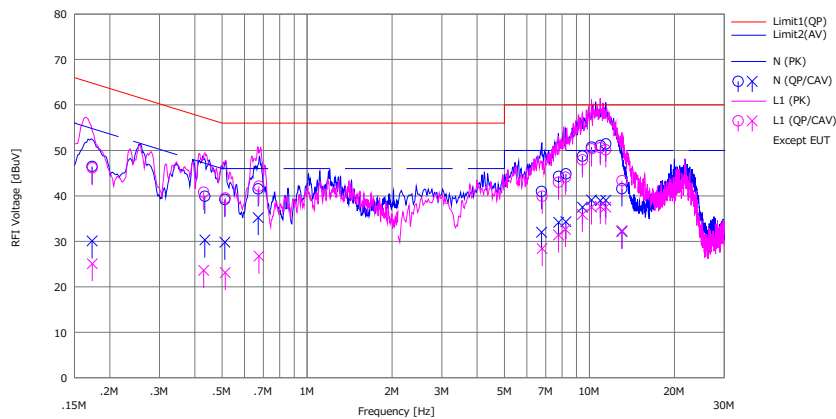
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/14

Mode : Tx_11g_2412 MHz
Power : AC 240 V / 60 Hz (EUT Input: DC 5 V)
Temp./Humi. : 23 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yasumasa Owaki



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.17315	33.90	17.50	12.59	46.49	30.09	64.81	54.81	18.3	24.7	N	
2	0.43422	27.30	17.70	12.60	39.90	30.30	57.17	47.17	17.2	16.8	N	
3	0.51120	26.60	17.20	12.61	39.21	29.81	56.00	46.00	16.7	16.1	N	
4	0.67069	28.90	22.60	12.63	41.53	35.23	56.00	46.00	14.4	10.7	N	
5	6.76751	27.80	18.80	13.19	40.99	31.99	60.00	50.00	19.0	18.0	N	
6	7.77359	31.00	20.90	13.29	44.29	34.19	60.00	50.00	15.7	15.8	N	
7	8.25317	31.50	21.00	13.33	44.83	34.33	60.00	50.00	15.1	15.6	N	
8	9.44378	35.30	24.10	13.45	48.75	37.55	60.00	50.00	11.2	12.4	N	
9	10.17380	37.20	25.60	13.51	50.71	39.11	60.00	50.00	9.2	10.8	N	
10	10.92680	37.50	25.40	13.58	51.08	38.98	60.00	50.00	8.9	11.0	N	
11	11.43129	37.80	25.40	13.63	51.43	39.03	60.00	50.00	8.5	10.9	N	
12	13.03200	27.80	18.40	13.76	41.56	32.16	60.00	50.00	18.4	17.8	N	
13	0.17345	33.60	12.50	12.58	46.18	25.08	64.79	54.79	18.6	29.7	L1	
14	0.43022	28.20	11.00	12.62	40.82	23.62	57.25	47.25	16.4	23.6	L1	
15	0.51280	26.90	10.50	12.63	39.53	23.13	56.00	46.00	16.4	22.8	L1	
16	0.67499	29.50	14.10	12.65	42.15	26.75	56.00	46.00	13.8	19.2	L1	
17	6.80107	26.80	15.30	13.11	39.91	28.41	60.00	50.00	20.0	21.5	L1	
18	7.76760	29.80	18.20	13.19	42.99	31.39	60.00	50.00	17.0	18.6	L1	
19	8.22360	30.90	19.40	13.22	44.12	32.62	60.00	50.00	15.8	17.3	L1	
20	9.44039	34.60	22.60	13.30	47.90	35.90	60.00	50.00	12.1	14.1	L1	
21	10.17639	37.00	24.20	13.35	50.35	37.55	60.00	50.00	9.6	12.4	L1	
22	10.92640	37.20	24.30	13.41	50.61	37.71	60.00	50.00	9.3	12.2	L1	
23	11.42288	36.70	24.10	13.44	50.14	37.54	60.00	50.00	9.8	12.4	L1	
24	13.03919	29.80	18.80	13.54	43.34	32.34	60.00	50.00	16.6	17.6	L1	

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

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Conducted Emission (DC 5.0 V line)

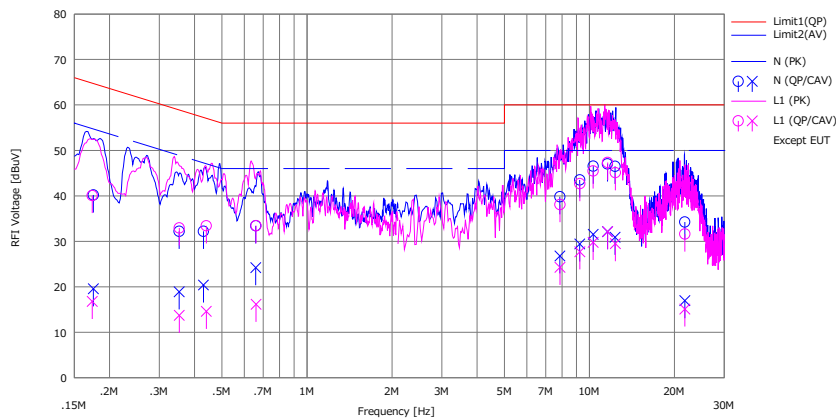
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/14

Mode : Tx_BLE_2480 MHz
Power : AC 240 V / 60 Hz (EUT Input: DC 5 V)
Temp./Humi. : 23 deg.C / 40 %RH

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yasumasa Owaki

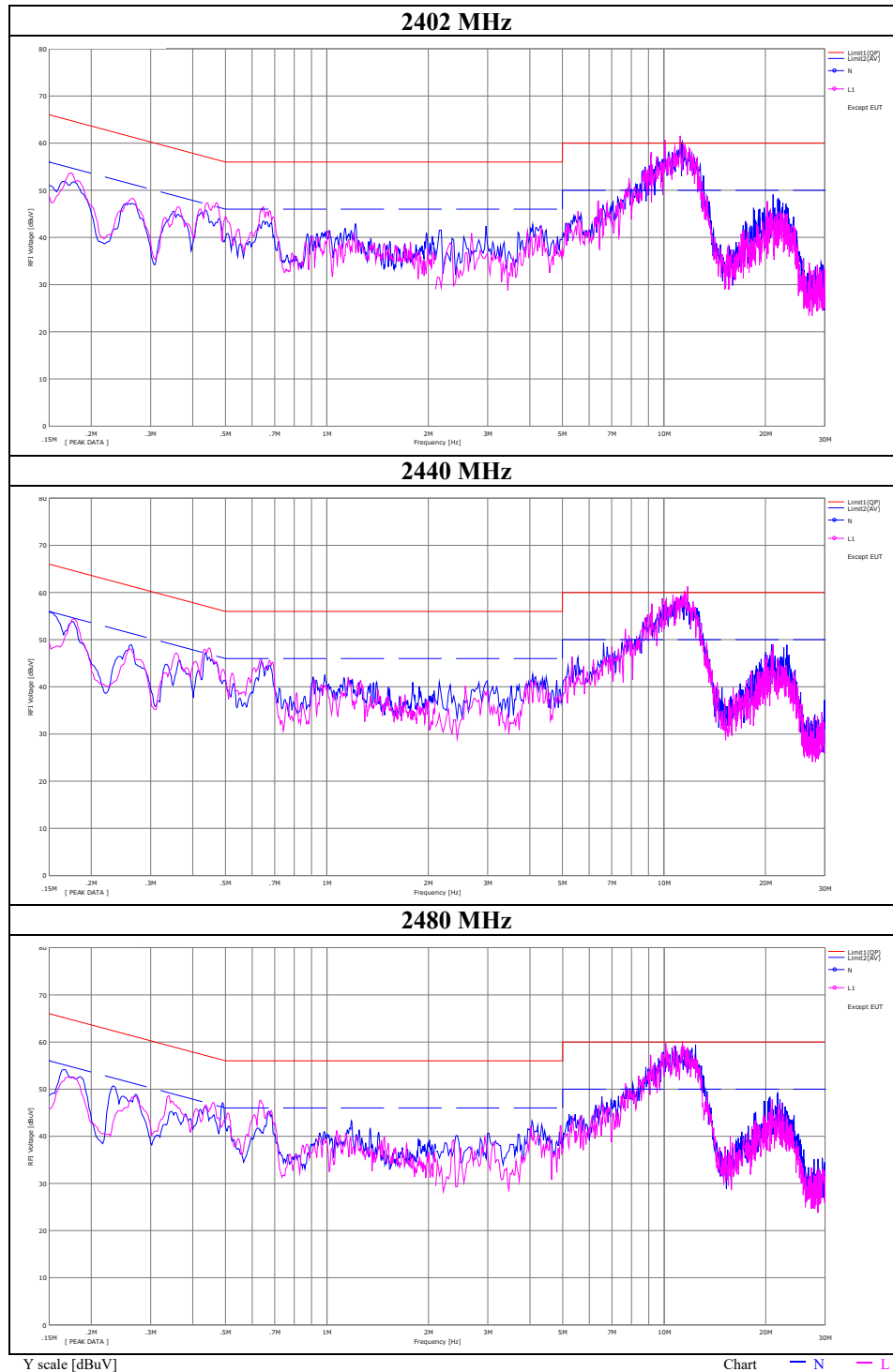


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.17530	27.60	7.00	12.59	40.19	19.59	64.71	54.71	24.5	35.1	N	
2	0.35293	19.60	6.30	12.61	32.21	18.91	58.89	48.89	26.6	29.9	N	
3	0.43003	19.60	7.80	12.60	32.20	20.40	57.25	47.25	25.0	26.8	N	
4	0.65848	20.80	11.60	12.63	33.43	24.23	56.00	46.00	22.5	21.7	N	
5	7.85781	26.50	13.50	13.30	39.80	26.80	60.00	50.00	20.2	23.2	N	
6	9.23951	30.10	16.00	13.43	43.53	29.43	60.00	50.00	16.4	20.5	N	
7	10.31209	33.00	18.00	13.53	46.53	31.53	60.00	50.00	13.4	18.4	N	
8	11.58152	33.40	18.50	13.64	47.04	32.14	60.00	50.00	12.9	17.8	N	
9	12.32822	32.80	17.20	13.70	46.50	30.90	60.00	50.00	13.5	19.1	N	
10	21.75062	20.00	2.70	14.26	34.26	16.96	60.00	50.00	25.7	33.0	N	
11	0.17370	27.50	4.20	12.58	40.08	16.78	64.78	54.78	24.7	38.0	L1	
12	0.35313	20.30	1.10	12.63	32.93	13.73	58.89	48.89	25.9	35.1	L1	
13	0.44022	20.80	2.00	12.62	33.42	14.62	57.06	47.06	23.6	32.4	L1	
14	0.66028	20.80	3.50	12.65	33.45	16.15	56.00	46.00	22.5	29.8	L1	
15	7.86380	24.90	11.10	13.19	38.09	24.29	60.00	50.00	21.9	25.7	L1	
16	9.24890	29.40	14.40	13.29	42.69	27.69	60.00	50.00	17.3	22.3	L1	
17	10.30250	32.10	16.40	13.37	45.47	29.77	60.00	50.00	14.5	20.2	L1	
18	11.59850	33.90	18.70	13.45	47.35	32.15	60.00	50.00	12.6	17.8	L1	
19	12.35000	31.60	16.00	13.50	45.10	29.50	60.00	50.00	14.9	20.5	L1	
20	21.76660	17.60	1.10	14.02	31.62	15.12	60.00	50.00	28.3	34.8	L1	

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

Conducted Emission (DC 5.0 V line)

Report No. 13282400S-A-R1
Test place Shonan EMC Lab. No.3 Shielded room
Date May 14, 2020
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Yasumasa Owaki
Mode Tx BT LE



UL Japan, Inc.

Shonan EMC Lab.

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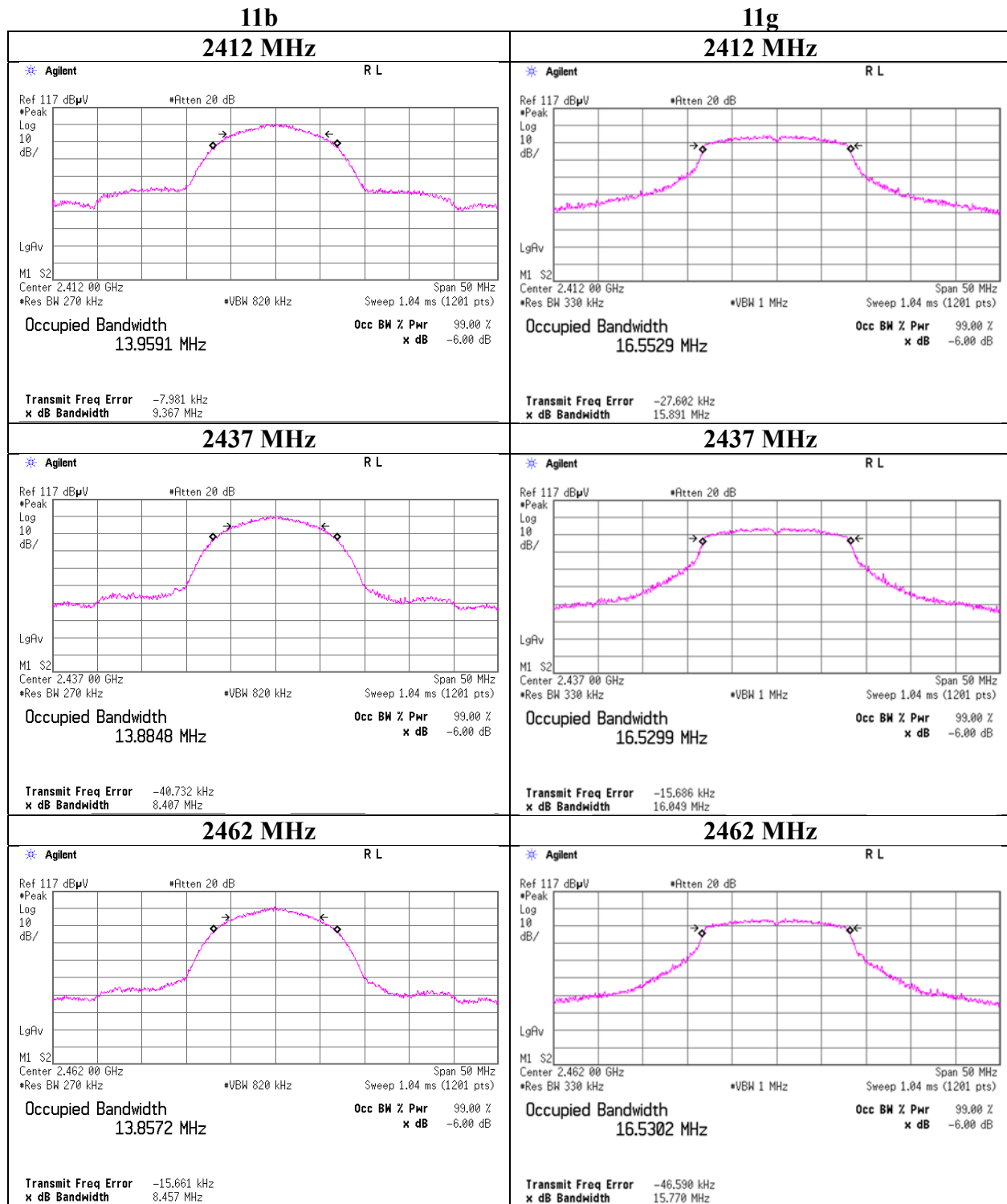
Facsimile : +81 463 50 6401

6 dB Bandwidth and 99 % Occupied Bandwidth

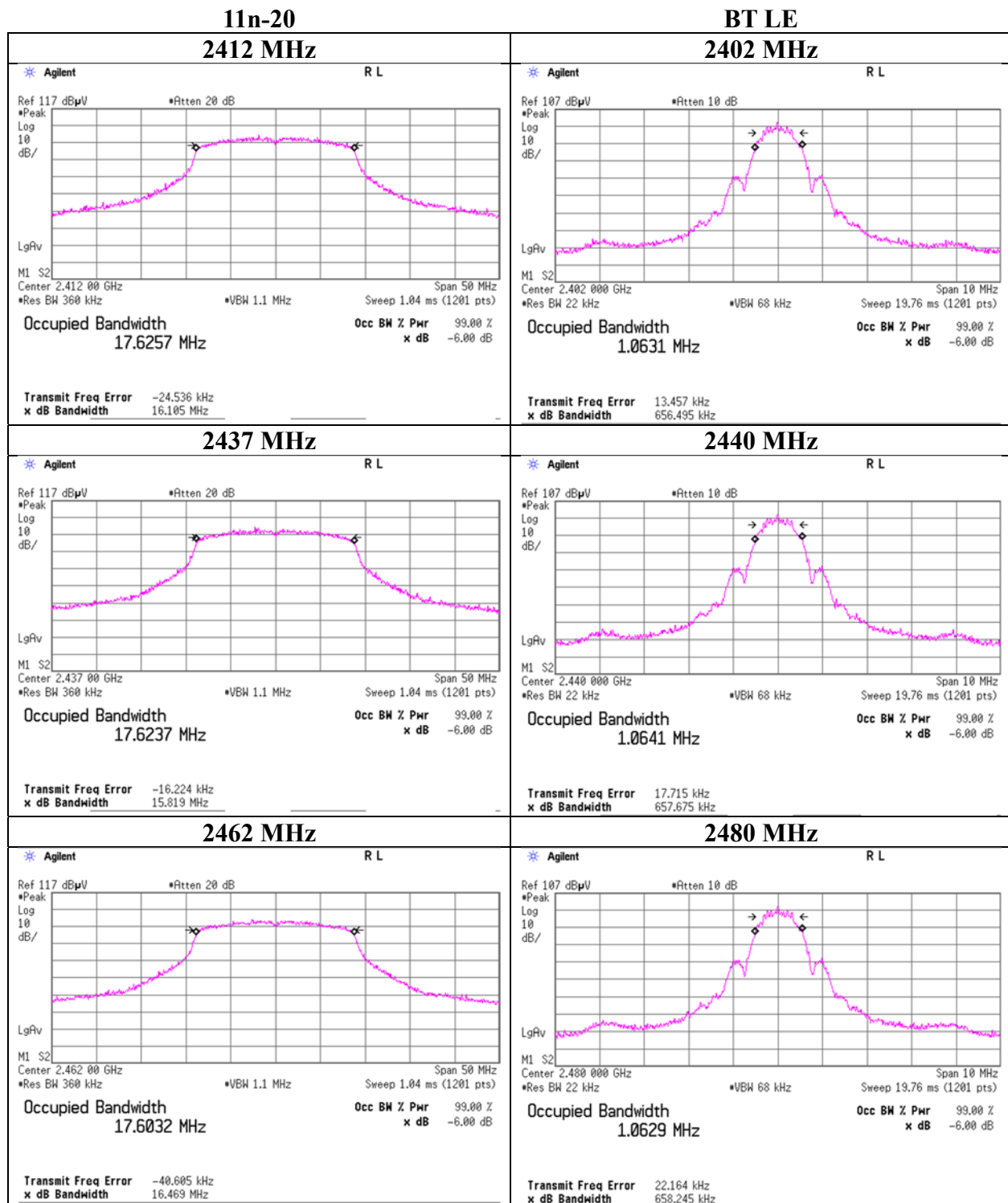
Report No.	13282400S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 22, 2020
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Takahiro Kawakami
Mode	Tx

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
11b	2412	13959.1	10.047	> 0.5000
	2437	13884.8	8.382	> 0.5000
	2462	13857.2	10.009	> 0.5000
11g	2412	16552.9	13.941	> 0.5000
	2437	16529.9	15.122	> 0.5000
	2462	16530.2	15.090	> 0.5000
11n-20	2412	17625.7	15.137	> 0.5000
	2437	17623.7	15.153	> 0.5000
	2462	17603.2	15.102	> 0.5000
BT LE	2402	1063.1	0.737	> 0.5000
	2440	1064.1	0.734	> 0.5000
	2480	1062.9	0.738	> 0.5000

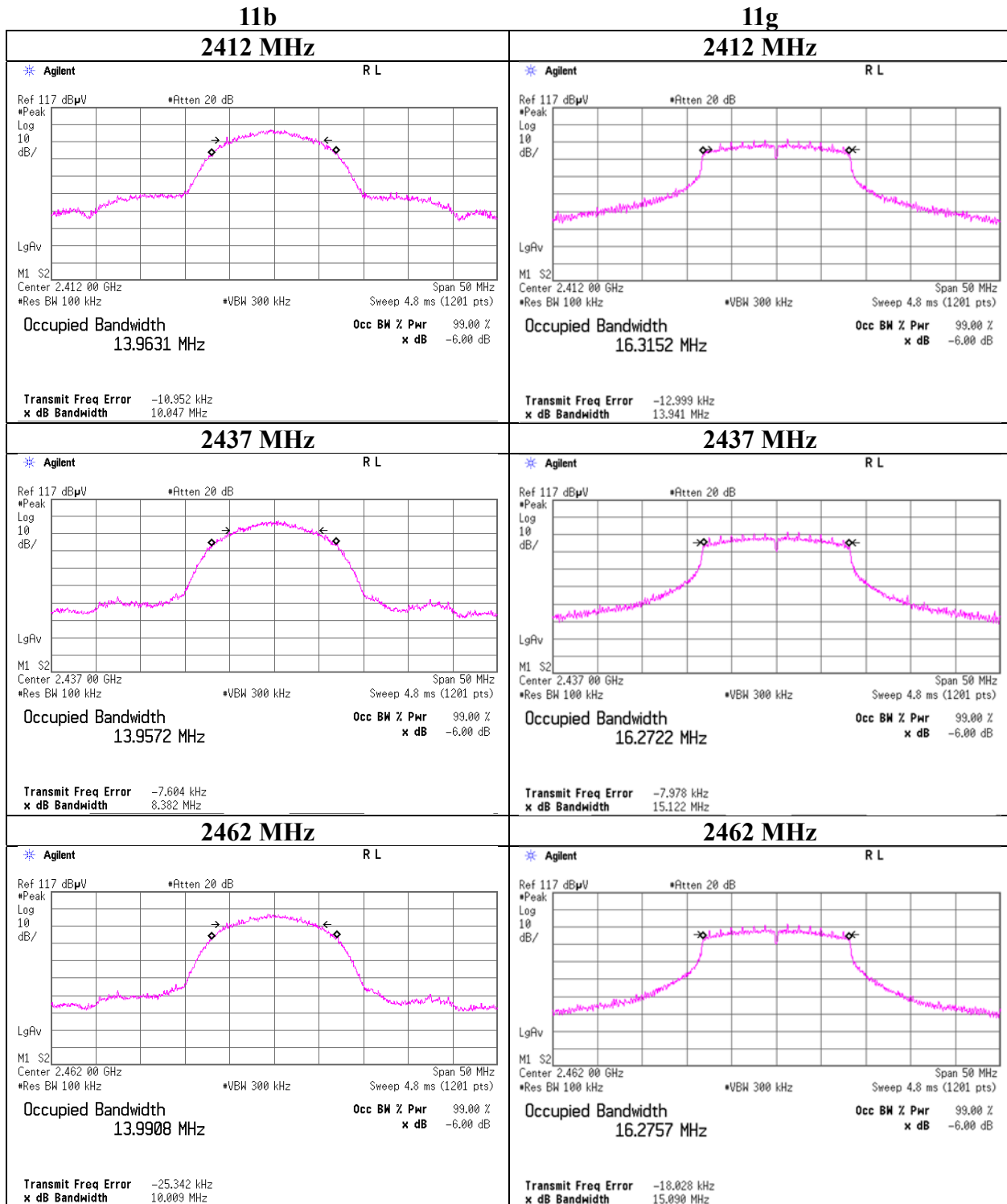
99 % Occupied Bandwidth



99 % Occupied Bandwidth



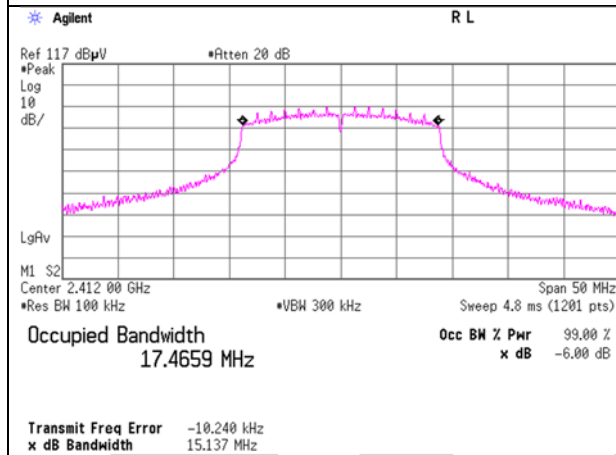
6 dB Bandwidth



6 dB Bandwidth

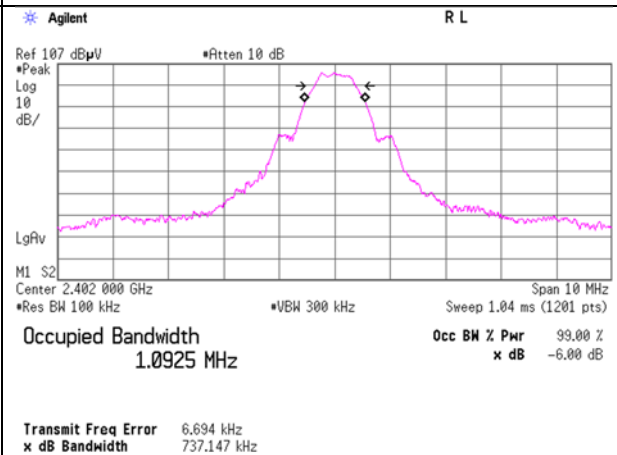
11n-20

2412 MHz

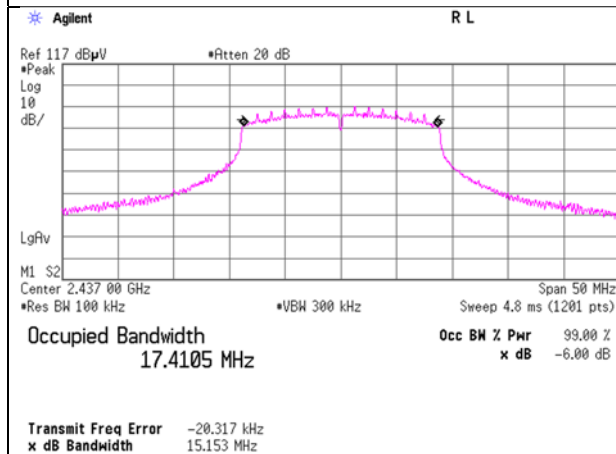


BT LE

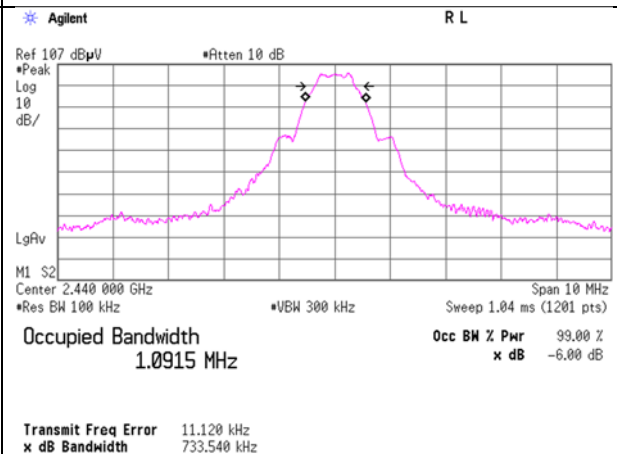
2402 MHz



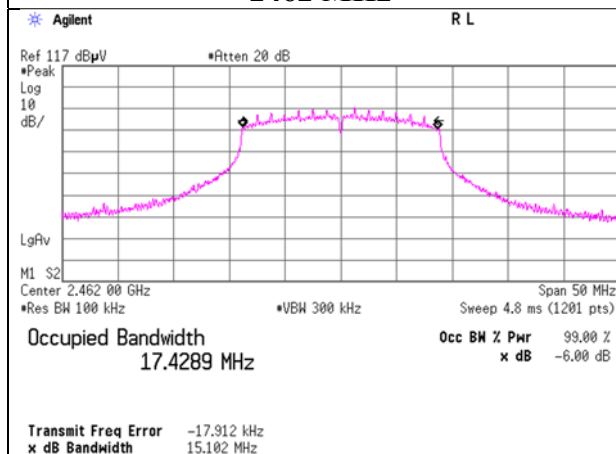
2437 MHz



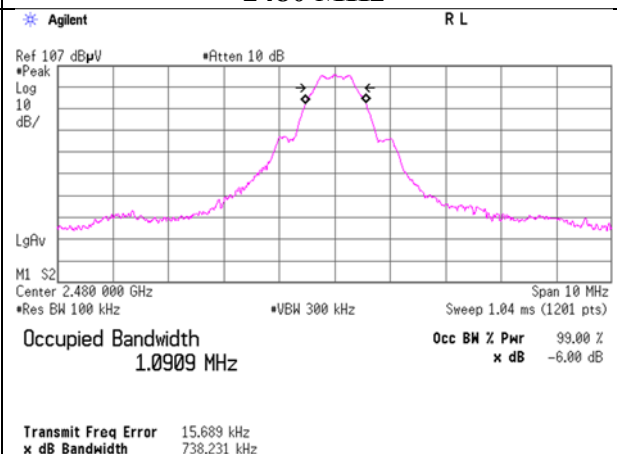
2440 MHz



2462 MHz



2480 MHz



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Maximum Peak Output Power

Report No. 13282400S-A-R1
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 20, 2020
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takahiro Kawakami
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]		
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]	
2412	8.29	1.44	9.63	19.36	86.30	30.00	1000	10.64	-3.70	15.66	36.81	36.02	4000	20.36	
2437	8.53	1.44	9.63	19.60	91.20	30.00	1000	10.40	-3.70	15.90	38.90	36.02	4000	20.12	
2462	8.25	1.45	9.63	19.33	85.70	30.00	1000	10.67	-3.70	15.63	36.56	36.02	4000	20.39	

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	8.01	
2	8.22	
5.5	8.20	
11	8.53	*

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13282400S-A-R1
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 20, 2020
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takahiro Kawakami
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]	
[MHz]	[dBm]	[dB]	[dB]					[dB]	[dBi]					[dB]
2412	12.89	1.44	9.63	23.96	248.89	30.00	1000	6.04	-3.70	20.26	106.17	36.02	4000	15.76
2437	12.83	1.44	9.63	23.90	245.47	30.00	1000	6.10	-3.70	20.20	104.71	36.02	4000	15.82
2462	12.62	1.45	9.63	23.70	234.42	30.00	1000	6.30	-3.70	20.00	100.00	36.02	4000	16.02

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	12.38	
9	12.83	*
12	12.22	
18	12.15	
24	11.99	
36	12.12	
48	11.95	
54	12.04	

*: Worst Rate

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

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Shonan EMC Lab.

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Maximum Peak Output Power

Report No. 13282400S-A-R1
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 20, 2020
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takahiro Kawakami
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	11.94	1.44	9.63	23.01	199.99	30.00	1000	6.99	-3.70	19.31	85.31	36.02	4000	16.71
2437	11.98	1.44	9.63	23.05	201.84	30.00	1000	6.95	-3.70	19.35	86.10	36.02	4000	16.67
2462	12.03	1.45	9.63	23.11	204.64	30.00	1000	6.89	-3.70	19.41	87.30	36.02	4000	16.61

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437MHz

mode	Reading	Remark
[MCS]	[dBm]	
0	11.61	
1	11.98	*
2	11.90	
3	11.06	
4	10.74	
5	11.77	
6	10.92	
7	10.57	

*: Worst Rate

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

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Maximum Peak Output Power

Report No. 13282400S-A-R1
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 21, 2020
Temperature / Humidity 22 deg. C / 45 % RH
Engineer Makoto Hosaka
Mode Tx BT LE

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]
2402	-3.95	1.43	9.63	7.11	5.14	30.00	1000	22.89	-3.70	3.41	2.19	36.02	4000	32.61
2440	-3.88	1.44	9.63	7.19	5.24	30.00	1000	22.81	-3.70	3.49	2.23	36.02	4000	32.53
2480	-3.84	1.46	9.63	7.25	5.31	30.00	1000	22.75	-3.70	3.55	2.26	36.02	4000	32.47

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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Average Output Power (Reference data for RF Exposure)

Report No. 13282400S-A-R1
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 20, 2020 April 21, 2020
Temperature / Humidity 23 deg. C / 39 % RH 22 deg. C / 45 % RH
Engineer Takahiro Kawakami Makoto Hosaka
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	5.50	1.44	9.63	16.57	45.39	0.04	16.61	45.81
2437	5.54	1.44	9.63	16.61	45.81	0.04	16.65	46.24
2462	5.46	1.45	9.63	16.54	45.08	0.04	16.58	45.50

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	1.56	1.44	9.63	12.63	18.32	0.28	12.91	19.54
2437	1.50	1.44	9.63	12.57	18.07	0.28	12.85	19.28
2462	1.49	1.45	9.63	12.57	18.07	0.28	12.85	19.28

11n-20 MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	0.17	1.44	9.63	11.24	13.30	0.30	11.54	14.26
2437	0.13	1.44	9.63	11.20	13.18	0.30	11.50	14.13
2462	0.06	1.45	9.63	11.14	13.00	0.30	11.44	13.93

BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-6.42	1.43	9.63	4.64	2.91	2.18	6.82	4.81
2440	-6.39	1.44	9.63	4.68	2.94	2.18	6.86	4.86
2480	-6.48	1.46	9.63	4.61	2.89	2.18	6.79	4.78

Sample Calculation:

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

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

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

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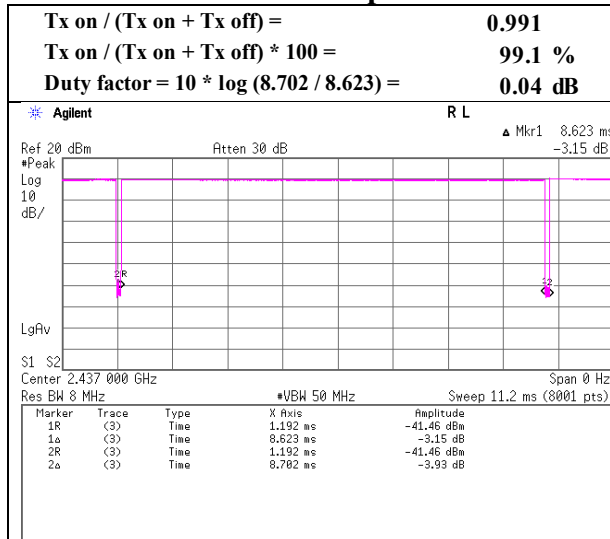
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

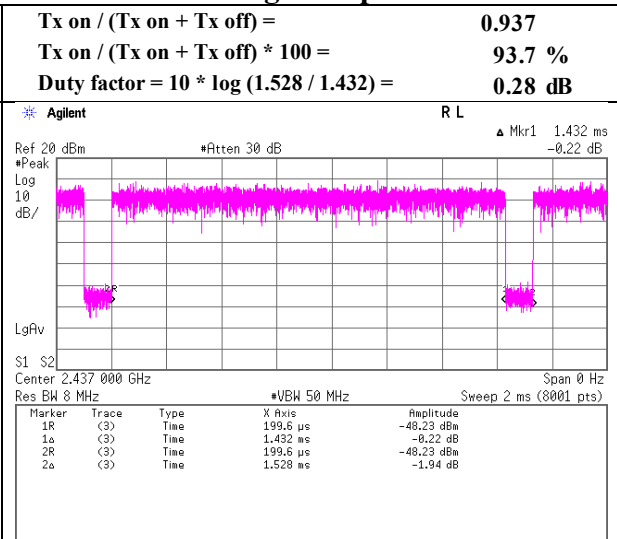
Burst rate confirmation (for Average Output Power)

Report No.	13282400S-A-R1	
Test place	Shonan EMC Lab. No.1 Measurement Room	
Date	April 20, 2020	April 21, 2020
Temperature / Humidity	23 deg. C / 39 % RH	22 deg. C / 45 % RH
Engineer	Takahiro Kawakami	Makoto Hosaka
Mode	Tx	

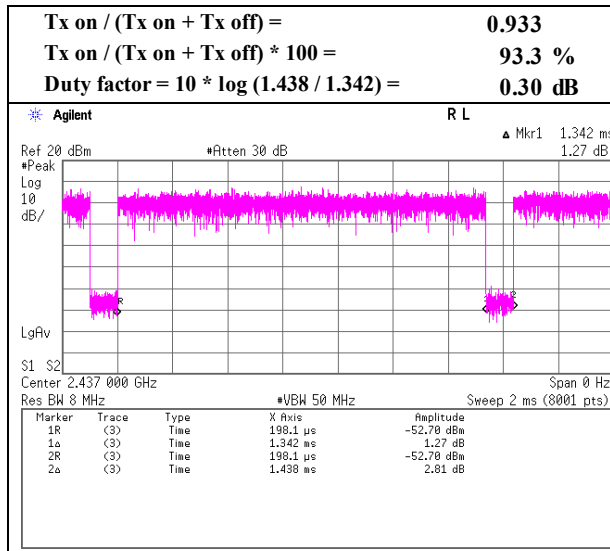
11b 1 Mbps



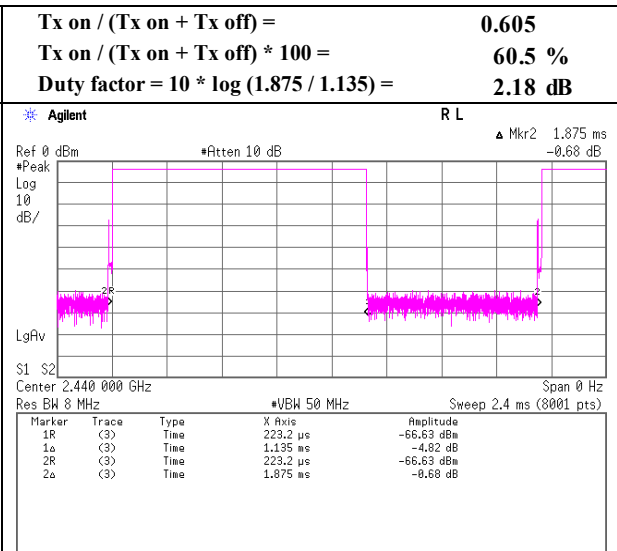
11g 6 Mbps



11n-20 MCS 0



BT LE

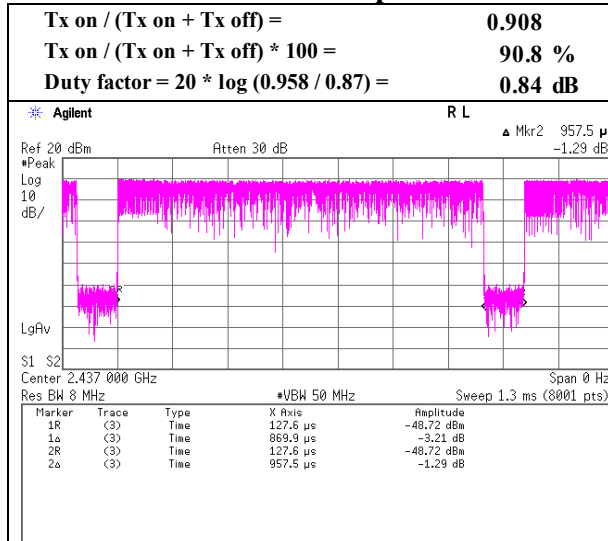


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

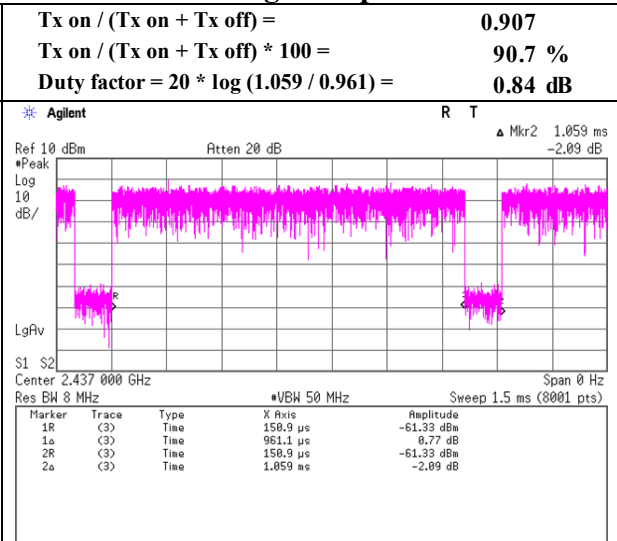
Burst rate confirmation (for Radiated Spurious Emission)

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 20, 2020 April 21, 2020
Temperature / Humidity	23 deg. C / 39 % RH 22 deg. C / 45 % RH
Engineer	Takahiro Kawakami Makoto Hosaka
Mode	Tx

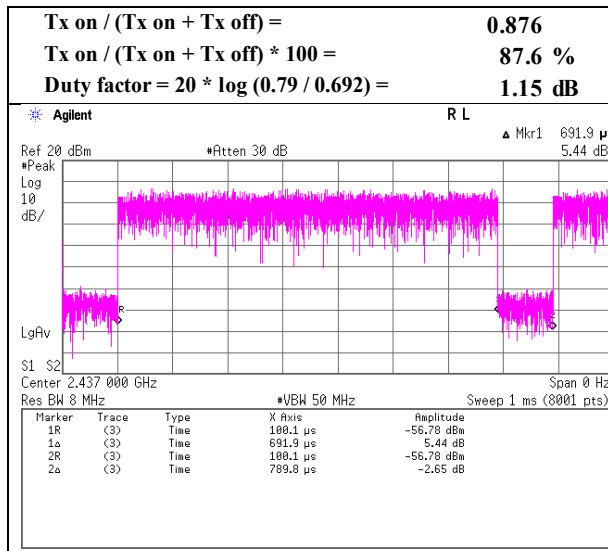
11b 11 Mbps



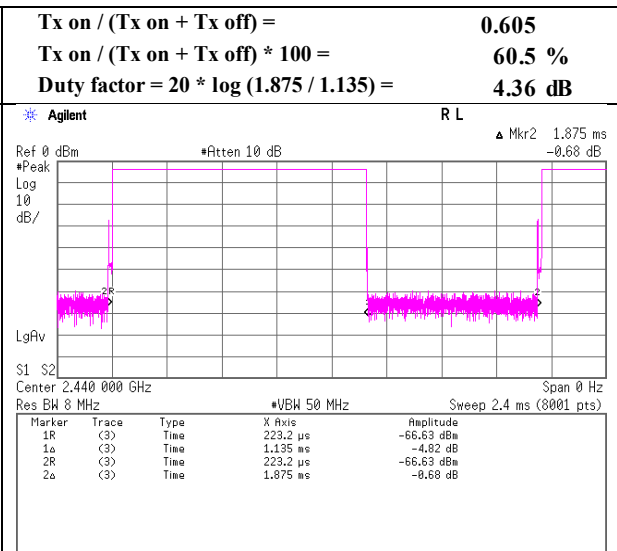
11g 9 Mbps



11n-20 MCS 1



BT LE



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

Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(1 GHz - 2.8 GHz)	(2.8 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	54.50	28.33	14.07	41.66	2.41	57.65	73.9	16.2	110	155	
Hori.	4824.000	PK	48.11	31.64	6.59	42.93	2.41	45.82	73.9	28.0	152	326	
Hori.	7236.000	PK	48.53	37.25	8.09	43.41	2.41	52.87	73.9	21.0	150	0	floor noise
Hori.	9648.000	PK	48.39	38.97	9.25	43.10	2.41	55.92	73.9	17.9	184	76	
Hori.	7236.000	AV	39.08	37.25	8.09	43.41	2.41	43.42	53.9	10.4	150	0	
Vert.	2390.000	PK	54.77	28.33	14.07	41.66	2.41	57.92	73.9	15.9	181	199	
Vert.	4824.000	PK	48.33	31.64	6.59	42.93	2.41	46.04	73.9	27.8	153	354	
Vert.	7236.000	PK	48.60	37.25	8.09	43.41	2.41	52.94	73.9	20.9	150	0	
Vert.	9648.000	PK	48.63	38.97	9.25	43.10	2.41	56.16	73.9	17.7	341	296	
Vert.	7236.000	AV	39.11	37.25	8.09	43.41	2.41	43.45	53.9	10.4	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.	2390.000	AV	45.55	28.33	14.07	41.66	0.84	2.41	49.54	53.9	4.3	*1)
Hori.	4824.000	AV	38.88	31.64	6.59	42.93	0.84	2.41	37.43	53.9	16.4	
Hori.	9648.000	AV	38.89	38.97	9.25	43.10	0.84	2.41	47.26	53.9	6.6	
Vert.	2390.000	AV	44.56	28.33	14.07	41.66	0.84	2.41	48.55	53.9	5.3	*1)
Vert.	4824.000	AV	38.86	31.64	6.59	42.93	0.84	2.41	37.41	53.9	16.4	
Vert.	9648.000	AV	38.92	38.97	9.25	43.10	0.84	2.41	47.29	53.9	6.6	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	93.55	28.29	14.08	41.67	2.41	96.66	-	-	Carrier
Hori.	2400.000	PK	61.40	28.31	14.07	41.67	2.41	64.52	76.66	12.1	
Vert.	2412.000	PK	92.21	28.29	14.08	41.67	2.41	95.32	-	-	Carrier
Vert.	2400.000	PK	60.06	28.31	14.07	41.67	2.41	63.18	75.32	12.1	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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

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Shonan EMC Lab.

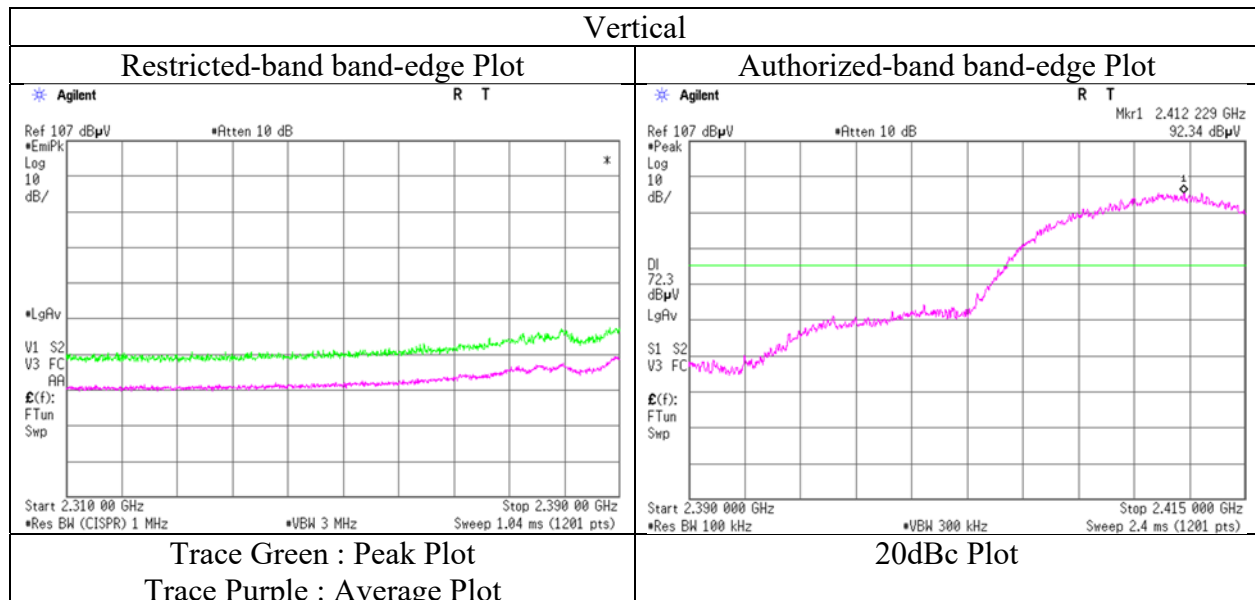
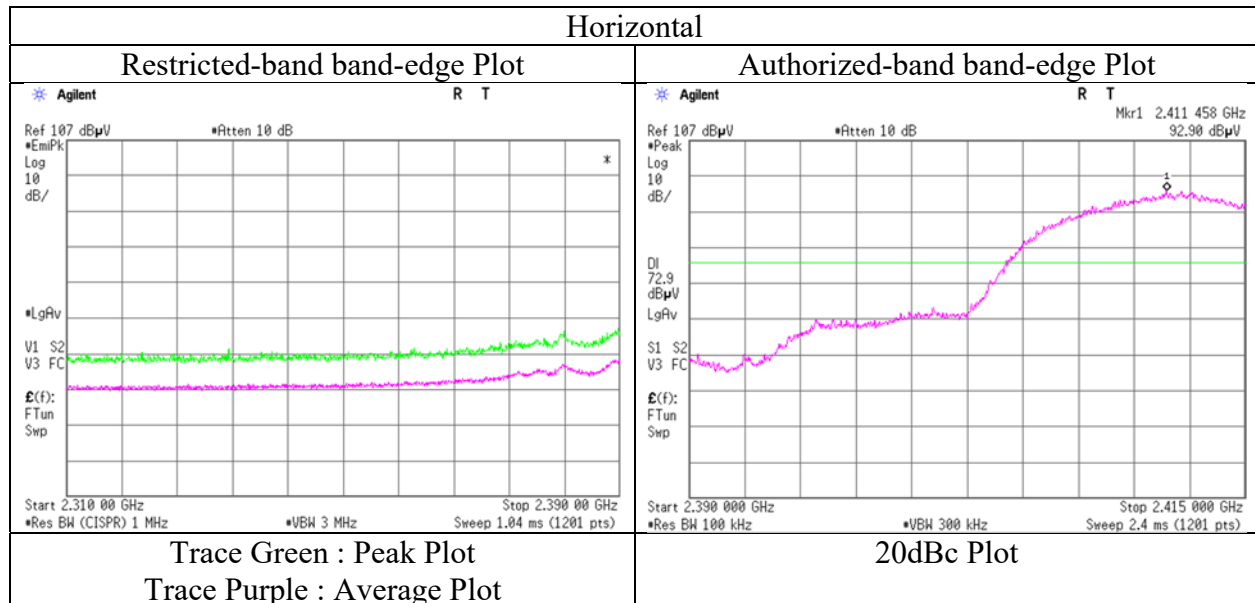
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Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 23, 2020
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 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.

Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(1 GHz - 2.8 GHz)	(2.8 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	47.76	31.70	6.62	42.93	2.41	45.56	73.9	28.3	154	341	
Hori.	7311.000	PK	48.28	37.36	8.13	43.48	2.41	52.70	73.9	21.2	150	0	
Hori.	9748.000	PK	48.31	39.31	9.30	42.98	2.41	56.35	73.9	17.5	153	85	
Hori.	7311.000	AV	38.97	37.36	8.13	43.48	2.41	43.39	53.9	10.5	150	0	floor noise
Vert.	4874.000	PK	47.91	31.70	6.62	42.93	2.41	45.71	73.9	28.1	151	350	
Vert.	7311.000	PK	48.27	37.36	8.13	43.48	2.41	52.69	73.9	21.2	150	0	
Vert.	9748.000	PK	48.72	39.31	9.30	42.98	2.41	56.76	73.9	17.1	234	306	
Vert.	7311.000	AV	38.89	37.36	8.13	43.48	2.41	43.31	53.9	10.5	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	38.37	31.70	6.62	42.93	0.84	2.41	37.01	53.9	16.8	
Hori.	9748.000	AV	38.95	39.31	9.30	42.98	0.84	2.41	47.83	53.9	6.0	
Vert.	4874.000	AV	38.31	31.70	6.62	42.93	0.84	2.41	36.95	53.9	16.9	
Vert.	9748.000	AV	39.21	39.31	9.30	42.98	0.84	2.41	48.09	53.9	5.8	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.

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Facsimile : +81 463 50 6401

Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(1 GHz - 2.8 GHz)	(2.8 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	49.98	28.24	14.16	41.69	2.41	53.10	73.9	20.8	261	133	
Hori.	2485.747	PK	51.02	28.23	14.16	41.70	2.41	54.12	73.9	19.7	261	133	
Hori.	4924.000	PK	47.95	31.82	6.64	42.94	2.41	45.88	73.9	28.0	154	349	
Hori.	7386.000	PK	48.06	37.49	8.18	43.55	2.41	52.59	73.9	21.3	150	0	
Hori.	9848.000	PK	48.21	39.33	9.36	42.87	2.41	56.44	73.9	17.4	157	78	
Hori.	7386.000	AV	39.01	37.49	8.18	43.55	2.41	43.54	53.9	10.3	150	0	floor noise
Vert.	2483.500	PK	49.78	28.24	14.16	41.69	2.41	52.90	73.9	21.0	188	190	
Vert.	2484.498	PK	49.88	28.24	14.16	41.69	2.41	53.00	73.9	20.9	188	190	
Vert.	4924.000	PK	47.75	31.82	6.64	42.94	2.41	45.68	73.9	28.2	152	344	
Vert.	7386.000	PK	48.13	37.49	8.18	43.55	2.41	52.66	73.9	21.2	150	0	
Vert.	9848.000	PK	48.56	39.33	9.36	42.87	2.41	56.79	73.9	17.1	302	299	
Vert.	7386.000	AV	38.86	37.49	8.18	43.55	2.41	43.39	53.9	10.5	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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

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	40.81	28.24	14.16	41.69	0.84	2.41	44.77	53.9	9.1	*1)
Hori.	2485.747	AV	41.73	28.23	14.16	41.70	0.84	2.41	45.67	53.9	8.2	
Hori.	4924.000	AV	38.52	31.82	6.64	42.94	0.84	2.41	37.29	53.9	16.6	
Hori.	9848.000	AV	38.98	39.33	9.36	42.87	0.84	2.41	48.05	53.9	5.8	
Vert.	2483.500	AV	39.89	28.24	14.16	41.69	0.84	2.41	43.85	53.9	10.0	*1)
Vert.	2484.498	AV	40.64	28.24	14.16	41.69	0.84	2.41	44.60	53.9	9.3	
Vert.	4924.000	AV	38.58	31.82	6.64	42.94	0.84	2.41	37.35	53.9	16.5	
Vert.	9848.000	AV	39.11	39.33	9.36	42.87	0.84	2.41	48.18	53.9	5.7	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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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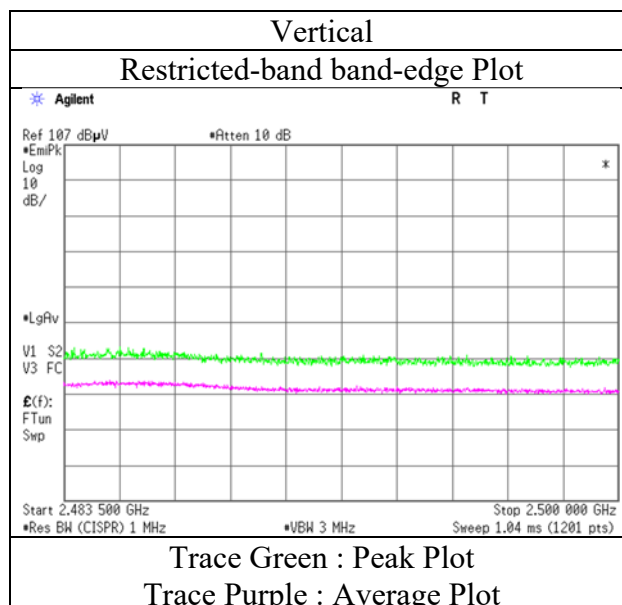
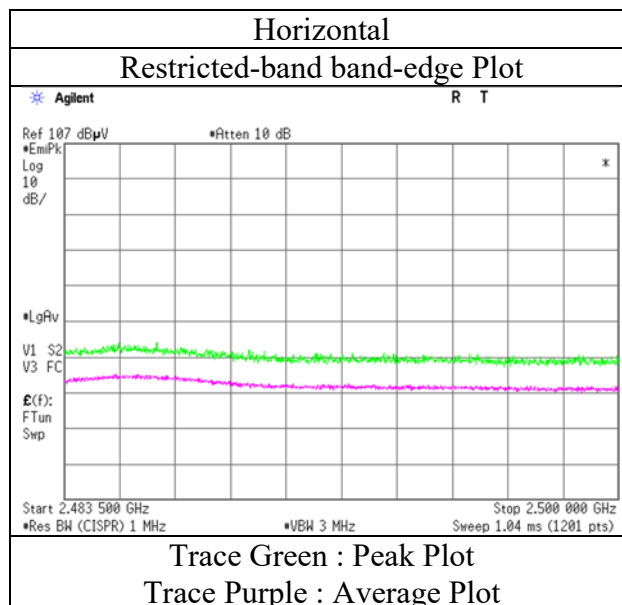
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 23, 2020
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 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.

Radiated Spurious Emission

Report No.	13282400S-A-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	April 27, 2020	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami (30 MHz - 1000 MHz)	Takahiro Kawakami (1 GHz - 2.8 GHz)	Yusuke Tanikawara (2.8 GHz - 13 GHz)	Hiromasa Sato (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.	30.169	QP	22.20	18.56	6.45	32.18	0.00	15.03	40.0	24.9	100	0	
Hori.	882.760	QP	20.30	21.94	10.77	31.14	0.00	21.87	46.0	24.1	100	0	
Hori.	2390.000	PK	62.76	28.33	14.07	41.66	2.41	65.91	73.9	7.9	277	134	
Hori.	4824.000	PK	47.95	31.64	6.59	42.93	2.41	45.66	73.9	28.2	152	346	
Hori.	7236.000	PK	48.12	37.25	8.09	43.41	2.41	52.46	73.9	21.4	150	0	
Hori.	9648.000	PK	48.05	38.97	9.25	43.10	2.41	55.58	73.9	18.3	198	90	
Hori.	7236.000	AV	39.02	37.25	8.09	43.41	2.41	43.36	53.9	10.5	150	0	floor noise
Vert.	35.838	QP	22.10	16.32	6.57	32.17	0.00	12.82	40.0	27.1	100	0	
Vert.	66.510	QP	29.00	6.94	6.55	32.15	0.00	10.34	40.0	29.6	100	143	
Vert.	67.087	QP	29.90	6.84	6.59	32.15	0.00	11.18	40.0	28.8	100	178	
Vert.	67.673	QP	30.60	6.81	6.62	32.15	0.00	11.88	40.0	28.1	100	134	
Vert.	68.261	QP	31.10	6.74	6.66	32.15	0.00	12.35	40.0	27.6	100	152	
Vert.	70.009	QP	30.50	6.50	6.75	32.15	0.00	11.60	40.0	28.4	100	154	
Vert.	70.582	QP	30.30	6.42	6.81	32.15	0.00	11.38	40.0	28.6	100	154	
Vert.	951.261	QP	20.00	22.06	10.98	30.63	0.00	22.41	46.0	23.5	100	0	
Vert.	2390.000	PK	58.63	28.33	14.07	41.66	2.41	61.78	73.9	12.1	116	219	
Vert.	4824.000	PK	48.32	31.64	6.59	42.93	2.41	46.03	73.9	27.8	146	357	
Vert.	7236.000	PK	48.32	37.25	8.09	43.41	2.41	52.66	73.9	21.2	150	0	
Vert.	9648.000	PK	48.29	38.97	9.25	43.10	2.41	55.82	73.9	18.0	324	309	
Vert.	7236.000	AV	39.05	37.25	8.09	43.41	2.41	43.39	53.9	10.5	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.	2390.000	AV	47.80	28.33	14.07	41.66	0.84	2.41	51.79	53.9	2.1	*1)
Hori.	4824.000	AV	38.59	31.64	6.59	42.93	0.84	2.41	37.14	53.9	16.7	
Hori.	9648.000	AV	38.81	38.97	9.25	43.10	0.84	2.41	47.18	53.9	6.7	
Vert.	2390.000	AV	44.50	28.33	14.07	41.66	0.84	2.41	48.49	53.9	5.4	*1)
Vert.	4824.000	AV	38.77	31.64	6.59	42.93	0.84	2.41	37.32	53.9	16.5	
Vert.	9648.000	AV	38.76	38.97	9.25	43.10	0.84	2.41	47.13	53.9	6.7	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	86.68	28.29	14.08	41.67	2.41	89.79	-	-	Carrier
Hori.	2400.000	PK	59.65	28.31	14.07	41.67	2.41	62.77	69.79	7.0	
Vert.	2412.000	PK	86.46	28.29	14.08	41.67	2.41	89.57	-	-	Carrier
Vert.	2400.000	PK	55.48	28.31	14.07	41.67	2.41	58.60	69.57	10.9	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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

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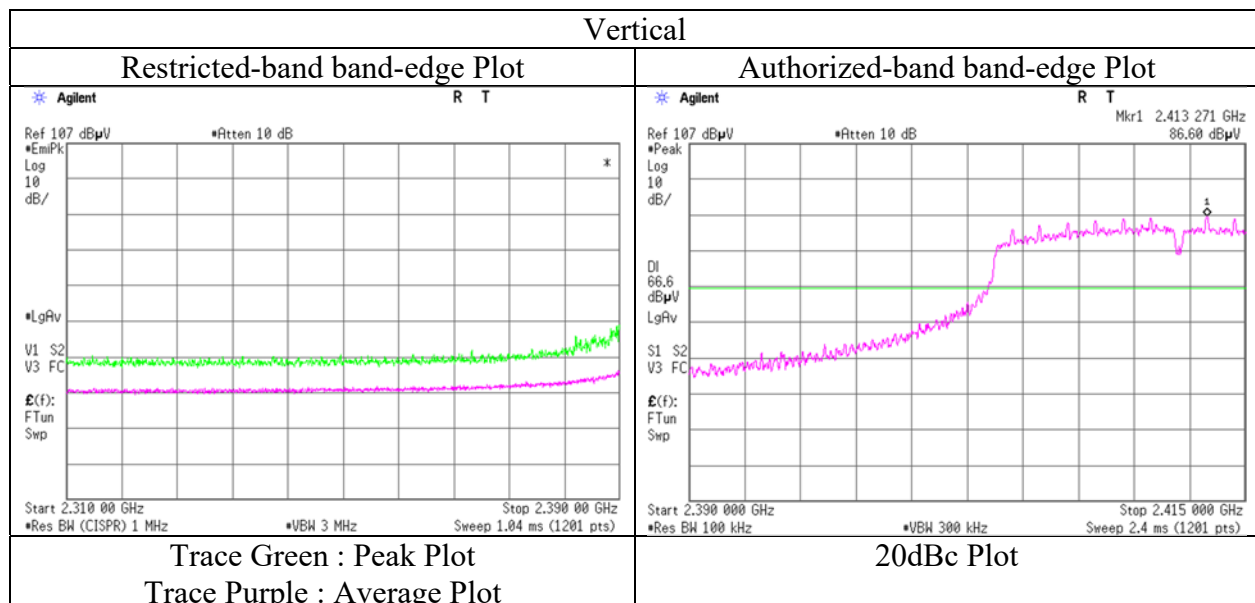
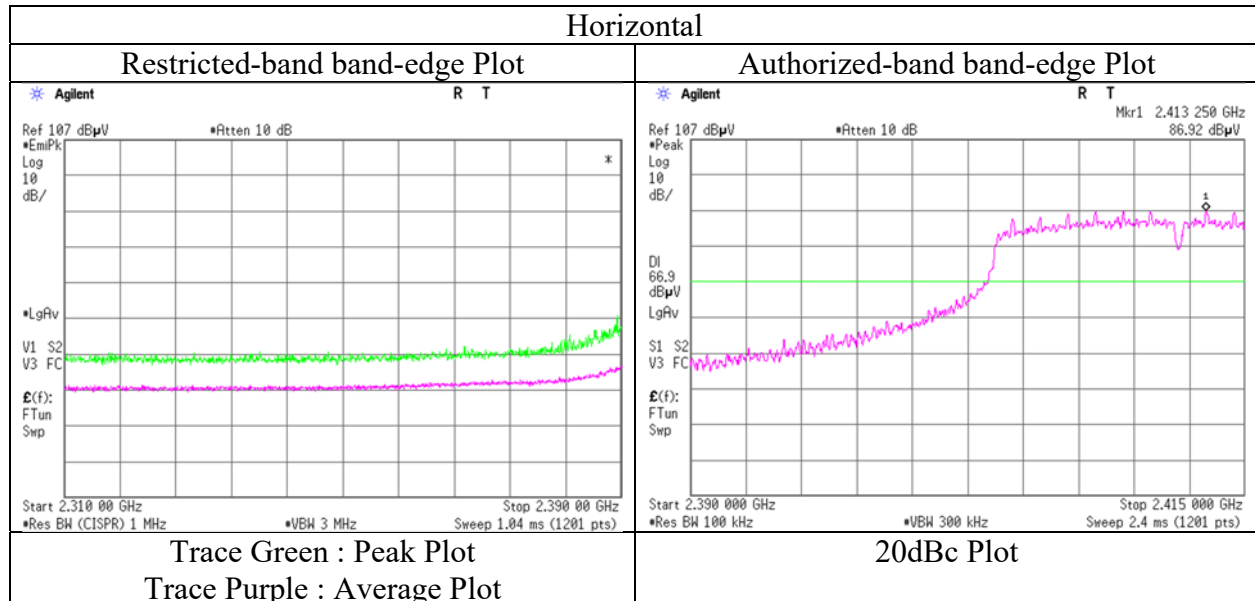
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 23, 2020
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 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.

Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(1 GHz - 2.8 GHz)	(2.8 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	47.97	31.70	6.62	42.93	2.41	45.77	73.9	28.1	158	358	
Hori.	7311.000	PK	48.37	37.36	8.13	43.48	2.41	52.79	73.9	21.1	150	0	
Hori.	9748.000	PK	48.35	39.31	9.30	42.98	2.41	56.39	73.9	17.5	196	74	
Hori.	7311.000	AV	38.86	37.36	8.13	43.48	2.41	43.28	53.9	10.6	150	0	floor noise
Vert.	4874.000	PK	47.55	31.70	6.62	42.93	2.41	45.35	73.9	28.5	151	344	
Vert.	7311.000	PK	48.10	37.36	8.13	43.48	2.41	52.52	73.9	21.3	150	0	
Vert.	9748.000	PK	48.54	39.31	9.30	42.98	2.41	56.58	73.9	17.3	245	307	
Vert.	7311.000	AV	38.86	37.36	8.13	43.48	2.41	43.28	53.9	10.6	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	38.41	31.70	6.62	42.93	0.84	2.41	37.05	53.9	16.8	
Hori.	9748.000	AV	38.98	39.31	9.30	42.98	0.84	2.41	47.86	53.9	6.0	
Vert.	4874.000	AV	38.38	31.70	6.62	42.93	0.84	2.41	37.02	53.9	16.8	
Vert.	9748.000	AV	39.18	39.31	9.30	42.98	0.84	2.41	48.06	53.9	5.8	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.

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Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(1 GHz - 2.8 GHz)	(2.8 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	51.15	28.24	14.16	41.69	2.41	54.27	73.9	19.6	262	134	
Hori.	4924.000	PK	48.03	31.82	6.64	42.94	2.41	45.96	73.9	27.9	149	339	
Hori.	7386.000	PK	47.95	37.49	8.18	43.55	2.41	52.48	73.9	21.4	150	0	
Hori.	9848.000	PK	47.95	39.33	9.36	42.87	2.41	56.18	73.9	17.7	175	74	
Hori.	7386.000	AV	38.75	37.49	8.18	43.55	2.41	43.28	53.9	10.6	150	0	floor noise
Vert.	2483.500	PK	49.91	28.24	14.16	41.69	2.41	53.03	73.9	20.8	135	210	
Vert.	4924.000	PK	47.72	31.82	6.64	42.94	2.41	45.65	73.9	28.2	144	356	
Vert.	7386.000	PK	47.87	37.49	8.18	43.55	2.41	52.40	73.9	21.5	150	0	
Vert.	9848.000	PK	48.45	39.33	9.36	42.87	2.41	56.68	73.9	17.2	264	305	
Vert.	7386.000	AV	38.64	37.49	8.18	43.55	2.41	43.17	53.9	10.7	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	40.94	28.24	14.16	41.69	0.84	2.41	44.90	53.9	9.0	*1)
Hori.	4924.000	AV	38.55	31.82	6.64	42.94	0.84	2.41	37.32	53.9	16.5	
Hori.	9848.000	AV	38.92	39.33	9.36	42.87	0.84	2.41	47.99	53.9	5.9	
Vert.	2483.500	AV	39.94	28.24	14.16	41.69	0.84	2.41	43.90	53.9	10.0	*1)
Vert.	4924.000	AV	38.38	31.82	6.64	42.94	0.84	2.41	37.15	53.9	16.7	
Vert.	9848.000	AV	39.01	39.33	9.36	42.87	0.84	2.41	48.08	53.9	5.8	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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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Shonan EMC Lab.

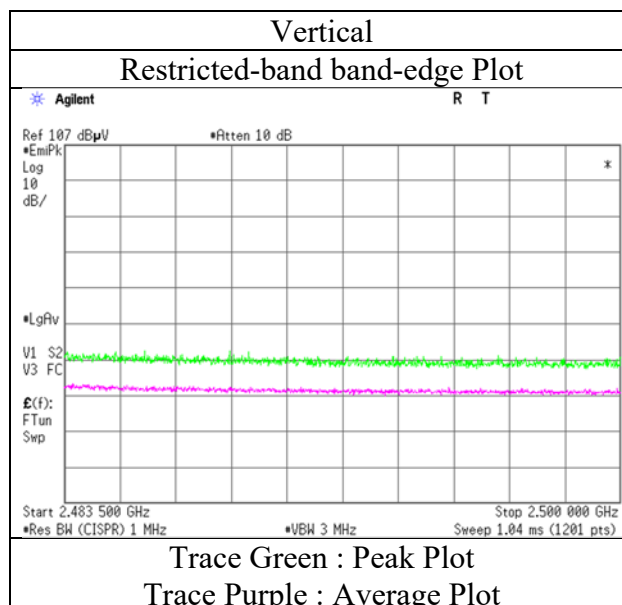
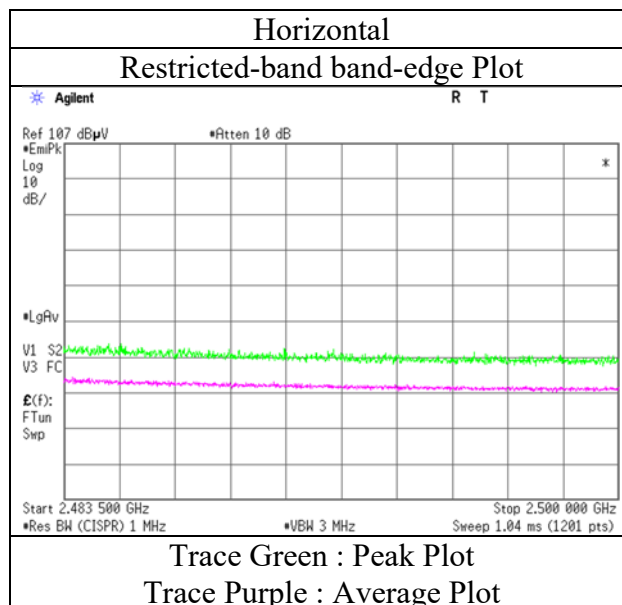
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 23, 2020
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 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.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(1 GHz - 2.8 GHz)	(2.8 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.	2390.000	PK	54.28	28.33	14.07	41.66	2.41	57.43	73.9	16.4	273	131	
Hori.	4824.000	PK	47.93	31.64	6.59	42.93	2.41	45.64	73.9	28.2	145	351	
Hori.	7236.000	PK	48.02	37.25	8.09	43.41	2.41	52.36	73.9	21.5	150	0	
Hori.	9648.000	PK	47.70	38.97	9.25	43.10	2.41	55.23	73.9	18.6	173	85	
Hori.	7236.000	AV	38.88	37.25	8.09	43.41	2.41	43.22	53.9	10.6	150	0	floor noise
Vert.	2390.000	PK	52.73	28.33	14.07	41.66	2.41	55.88	73.9	18.0	182	228	
Vert.	4824.000	PK	48.22	31.64	6.59	42.93	2.41	45.93	73.9	27.9	149	346	
Vert.	7236.000	PK	48.19	37.25	8.09	43.41	2.41	52.53	73.9	21.3	150	0	
Vert.	9648.000	PK	48.09	38.97	9.25	43.10	2.41	55.62	73.9	18.2	237	315	
Vert.	7236.000	AV	38.89	37.25	8.09	43.41	2.41	43.23	53.9	10.6	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.	2390.000	AV	43.52	28.33	14.07	41.66	1.15	2.41	47.82	53.9	6.0	*1)
Hori.	4824.000	AV	38.89	31.64	6.59	42.93	1.15	2.41	37.75	53.9	16.1	
Hori.	9648.000	AV	38.65	38.97	9.25	43.10	1.15	2.41	47.33	53.9	6.5	
Vert.	2390.000	AV	41.88	28.33	14.07	41.66	1.15	2.41	46.18	53.9	7.7	*1)
Vert.	4824.000	AV	38.82	31.64	6.59	42.93	1.15	2.41	37.68	53.9	16.2	
Vert.	9648.000	AV	38.94	38.97	9.25	43.10	1.15	2.41	47.62	53.9	6.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	85.64	28.29	14.08	41.67	2.41	88.75	-	-	Carrier
Hori.	2400.000	PK	54.56	28.31	14.07	41.67	2.41	57.68	68.75	11.0	
Vert.	2412.000	PK	83.78	28.29	14.08	41.67	2.41	86.89	-	-	Carrier
Vert.	2400.000	PK	52.29	28.31	14.07	41.67	2.41	55.41	66.89	11.4	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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

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Shonan EMC Lab.

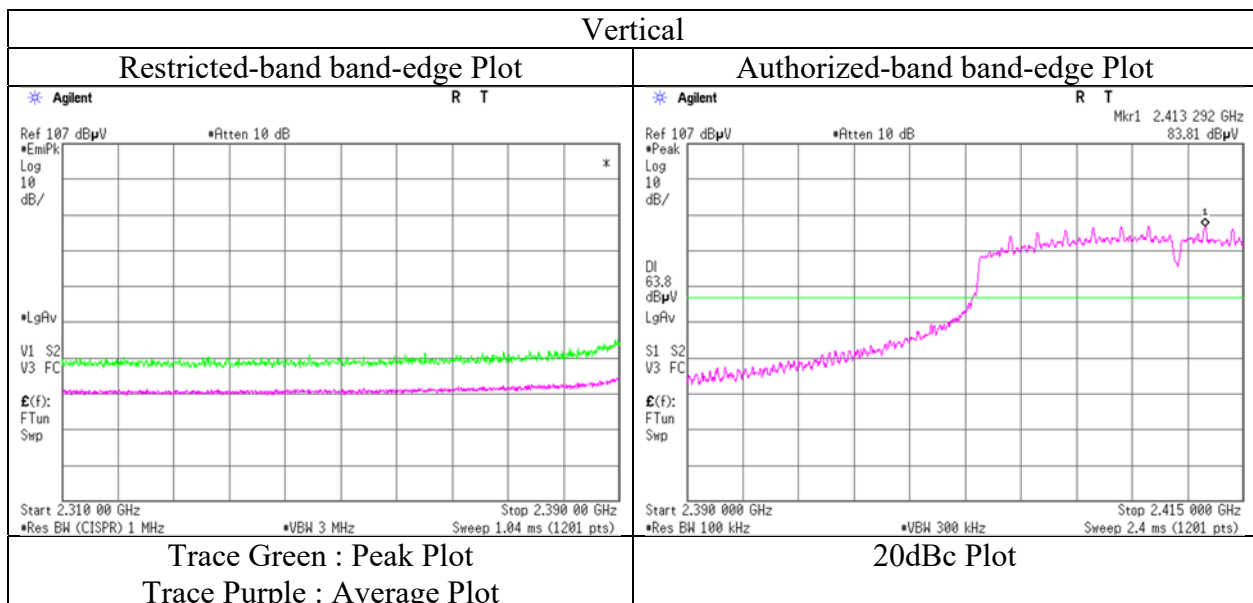
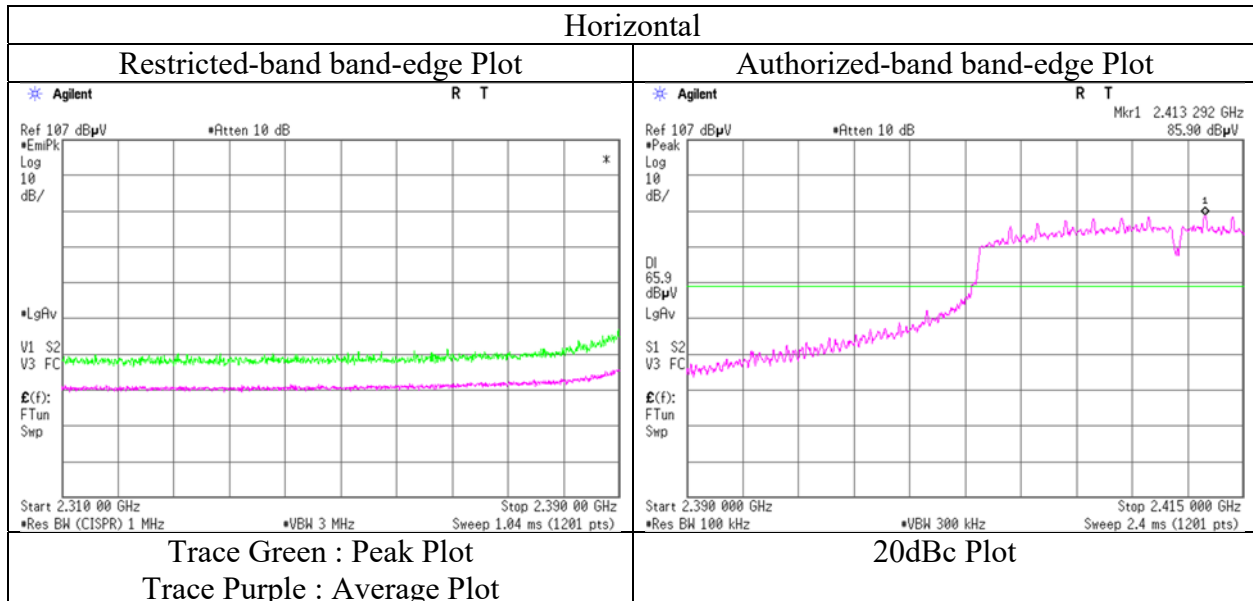
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 23, 2020
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 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.

Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami (1 GHz - 2.8 GHz)	Yusuke Tanikawara (2.8 GHz - 13 GHz)	Hiromasa Sato (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	47.56	31.70	6.62	42.93	2.41	45.36	73.9	28.5	150	351	
Hori.	7311.000	PK	47.98	37.36	8.13	43.48	2.41	52.40	73.9	21.5	150	0	
Hori.	9748.000	PK	48.19	39.31	9.30	42.98	2.41	56.23	73.9	17.6	173	307	
Hori.	7311.000	AV	38.83	37.36	8.13	43.48	2.41	43.25	53.9	10.6	150	0	floor noise
Vert.	4874.000	PK	47.78	31.70	6.62	42.93	2.41	45.58	73.9	28.3	153	354	
Vert.	7311.000	PK	48.33	37.36	8.13	43.48	2.41	52.75	73.9	21.1	150	0	
Vert.	9748.000	PK	48.35	39.31	9.30	42.98	2.41	56.39	73.9	17.5	247	312	
Vert.	7311.000	AV	38.98	37.36	8.13	43.48	2.41	43.40	53.9	10.5	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	38.45	31.70	6.62	42.93	1.15	2.41	37.40	53.9	16.5	
Hori.	9748.000	AV	38.51	39.31	9.30	42.98	1.15	2.41	47.70	53.9	6.2	
Vert.	4874.000	AV	38.24	31.70	6.62	42.93	1.15	2.41	37.19	53.9	16.7	
Vert.	9748.000	AV	39.33	39.31	9.30	42.98	1.15	2.41	48.52	53.9	5.3	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.

UL Japan, Inc.

Shonan EMC Lab.

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Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yusuke Tanikawara	Hiromasa Sato
	(1 GHz - 2.8 GHz)	(2.8 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	50.17	28.24	14.16	41.69	2.41	53.29	73.9	20.6	264	134	
Hori.	4924.000	PK	47.78	31.82	6.64	42.94	2.41	45.71	73.9	28.1	151	356	
Hori.	7386.000	PK	47.50	37.49	8.18	43.55	2.41	52.03	73.9	21.8	150	0	
Hori.	9848.000	PK	48.00	39.33	9.36	42.87	2.41	56.23	73.9	17.6	213	87	
Hori.	7386.000	AV	38.73	37.49	8.18	43.55	2.41	43.26	53.9	10.6	150	0	floor noise
Vert.	2483.500	PK	49.43	28.24	14.16	41.69	2.41	52.55	73.9	21.3	190	191	
Vert.	4924.000	PK	47.98	31.82	6.64	42.94	2.41	45.91	73.9	27.9	147	343	
Vert.	7386.000	PK	48.02	37.49	8.18	43.55	2.41	52.55	73.9	21.3	150	0	
Vert.	9848.000	PK	48.31	39.33	9.36	42.87	2.41	56.54	73.9	17.3	247	318	
Vert.	7386.000	AV	38.61	37.49	8.18	43.55	2.41	43.14	53.9	10.7	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	40.51	28.24	14.16	41.69	1.15	2.41	44.78	53.9	9.1	*1)
Hori.	4924.000	AV	38.46	31.82	6.64	42.94	1.15	2.41	37.54	53.9	16.3	
Hori.	9848.000	AV	38.96	39.33	9.36	42.87	1.15	2.41	48.34	53.9	5.5	
Vert.	2483.500	AV	39.72	28.24	14.16	41.69	1.15	2.41	43.99	53.9	9.9	*1)
Vert.	4924.000	AV	38.54	31.82	6.64	42.94	1.15	2.41	37.62	53.9	16.2	
Vert.	9848.000	AV	39.17	39.33	9.36	42.87	1.15	2.41	48.55	53.9	5.3	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

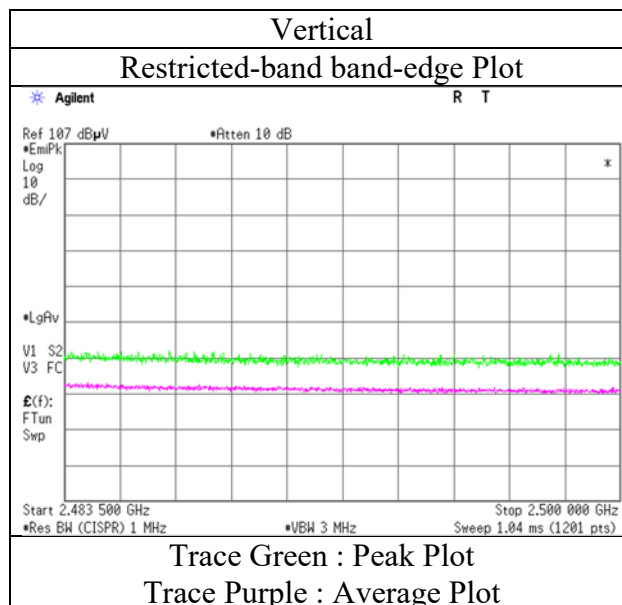
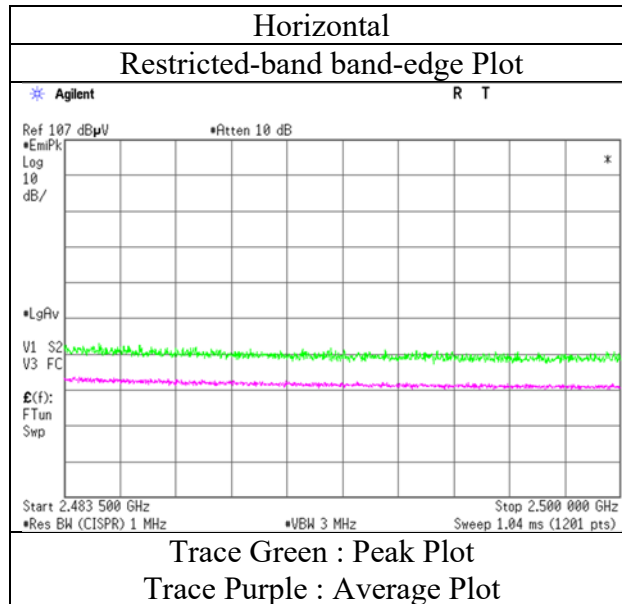
13 GHz - 26.5 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

Radiated Spurious Emission (Reference Plot for band-edge)

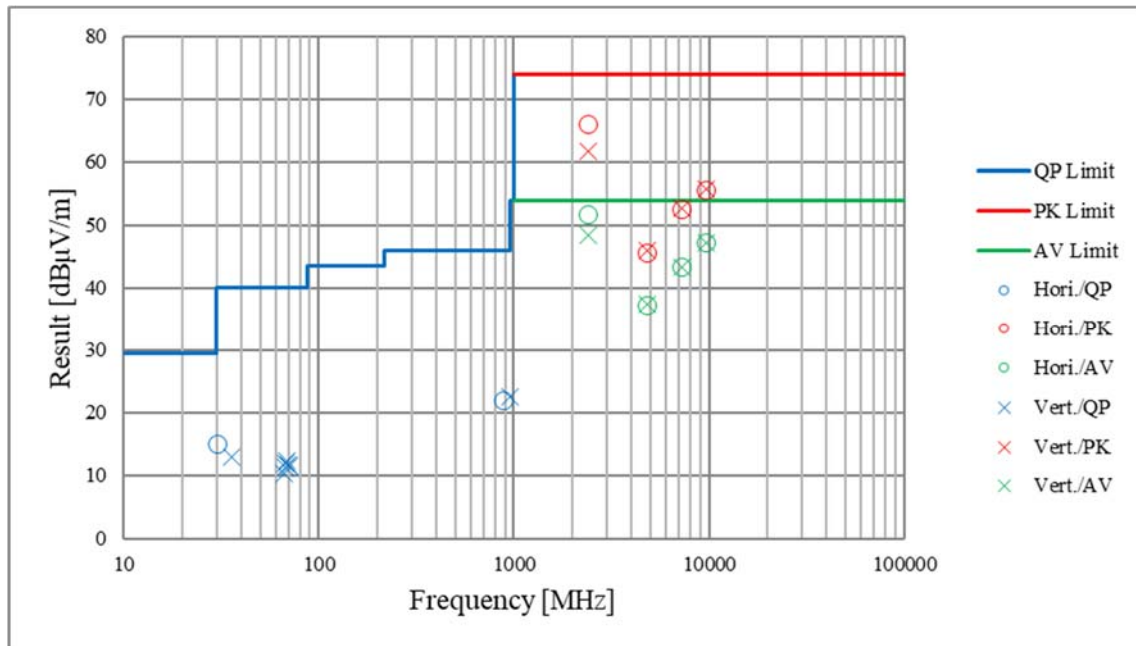
Report No. 13282400S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date April 23, 2020
Temperature / Humidity 21 deg. C / 31 % RH
Engineer Takahiro Kawakami
(1 GHz - 2.8 GHz)
Mode Tx 11n-20 2462 MHz



* 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.

Radiated Spurious Emission (Plot data, Worst case)

Report No.	13282400S-A-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	April 27, 2020	April 23, 2020	April 25, 2020	April 26, 2020
Temperature / Humidity	21 deg. C / 34 % RH	21 deg. C / 31 % RH	22 deg. C / 34 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami (30 MHz - 1000 MHz)	Takahiro Kawakami (1 GHz - 2.8 GHz)	Yusuke Tanikawara (2.8 GHz - 13 GHz)	Hiromasa Sato (13 GHz - 26.5 GHz)
Mode	Tx 11g 2412 MHz			



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

Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 28, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx BT LE 2402 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	39.180	QP	21.70	15.05	6.63	32.17	0.00	11.21	40.0	28.7	100	0	
Hori.	949.869	QP	20.10	22.04	10.98	30.65	0.00	22.47	46.0	23.5	100	0	
Hori.	2390.000	PK	47.11	28.33	14.07	41.66	2.41	50.26	73.9	23.6	107	155	
Hori.	4804.000	PK	48.73	31.62	6.58	42.92	2.41	46.42	73.9	27.4	144	147	
Hori.	7206.000	PK	48.53	37.23	8.08	43.39	2.41	52.86	73.9	21.0	150	0	
Hori.	9608.000	PK	47.75	38.84	9.21	43.14	2.41	55.07	73.9	18.8	150	0	
Hori.	7206.000	AV	39.32	37.23	8.08	43.39	2.41	43.65	53.9	10.2	150	0	floor noise
Hori.	9608.000	AV	38.35	38.84	9.21	43.14	2.41	45.67	53.9	8.2	150	0	floor noise
Vert.	35.535	QP	23.70	16.46	6.55	32.17	0.00	14.54	40.0	25.4	100	0	
Vert.	64.689	QP	28.20	7.28	6.47	32.15	0.00	9.80	40.0	30.2	100	191	
Vert.	67.013	QP	31.00	6.84	6.59	32.15	0.00	12.28	40.0	27.7	100	156	
Vert.	67.595	QP	31.10	6.81	6.61	32.15	0.00	12.37	40.0	27.6	100	153	
Vert.	68.138	QP	30.90	6.76	6.65	32.15	0.00	12.16	40.0	27.8	100	186	
Vert.	69.910	QP	29.10	6.51	6.75	32.15	0.00	10.21	40.0	29.7	100	147	
Vert.	70.508	QP	28.50	6.43	6.80	32.15	0.00	9.58	40.0	30.4	100	154	
Vert.	924.662	QP	20.30	21.99	10.90	30.85	0.00	22.34	46.0	23.6	100	0	
Vert.	2390.000	PK	48.43	28.33	14.07	41.66	2.41	51.58	73.9	22.3	114	219	
Vert.	4804.000	PK	47.74	31.62	6.58	42.92	2.41	45.43	73.9	28.4	317	278	
Vert.	7206.000	PK	48.27	37.23	8.08	43.39	2.41	52.60	73.9	21.3	150	0	
Vert.	9608.000	PK	47.29	38.84	9.21	43.14	2.41	54.61	73.9	19.2	150	0	
Vert.	7206.000	AV	39.09	37.23	8.08	43.39	2.41	43.42	53.9	10.4	150	0	floor noise
Vert.	9608.000	AV	38.15	38.84	9.21	43.14	2.41	45.47	53.9	8.4	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96 \text{ m} / 3.0 \text{ m}) = 2.41 \text{ dB}$

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.	2390.000	AV	38.17	28.33	14.07	41.66	4.36	2.41	45.68	53.9	8.2	*1)
Hori.	4804.000	AV	39.29	31.62	6.58	42.92	4.36	2.41	41.34	53.9	12.5	
Vert.	2390.000	AV	37.76	28.33	14.07	41.66	4.36	2.41	45.27	53.9	8.6	*1)
Vert.	4804.000	AV	39.81	31.62	6.58	42.92	4.36	2.41	41.86	53.9	12.0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96 \text{ m} / 3.0 \text{ m}) = 2.41 \text{ dB}$

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.	2402.000	PK	92.14	28.31	14.08	41.67	2.41	95.27	-	-	
Hori.	2400.000	PK	40.55	28.31	14.07	41.67	2.41	43.67	75.27	31.6	
Vert.	2402.000	PK	90.81	28.31	14.08	41.67	2.41	93.94	-	-	
Vert.	2400.000	PK	39.61	28.31	14.07	41.67	2.41	42.73	73.94	31.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96 \text{ m} / 3.0 \text{ m}) = 2.41 \text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

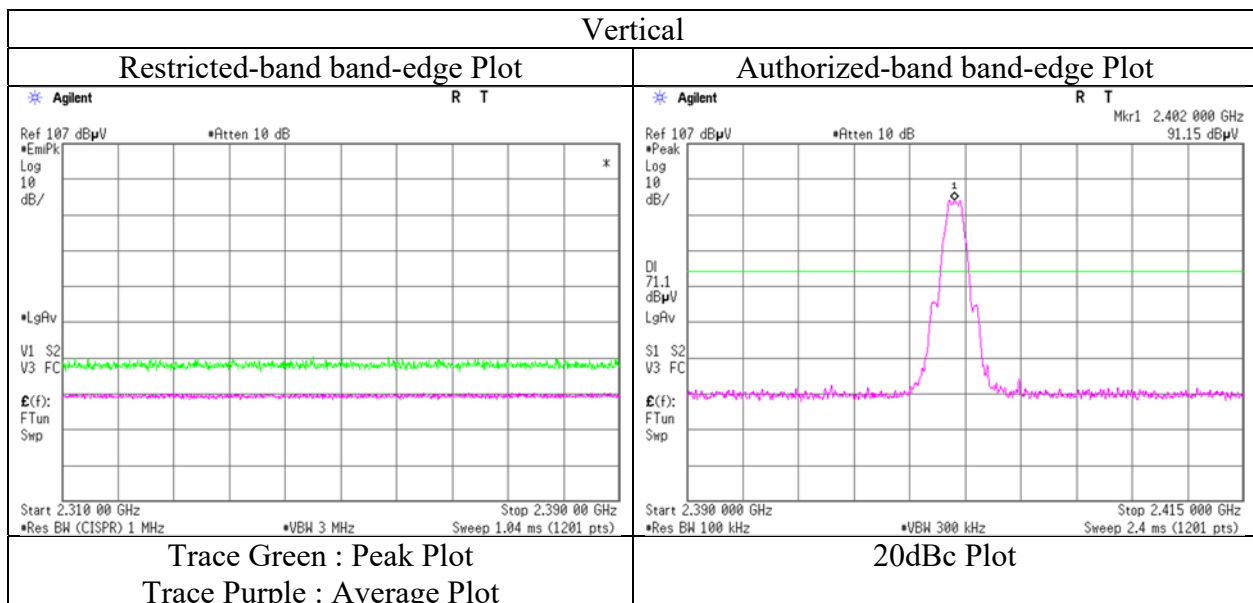
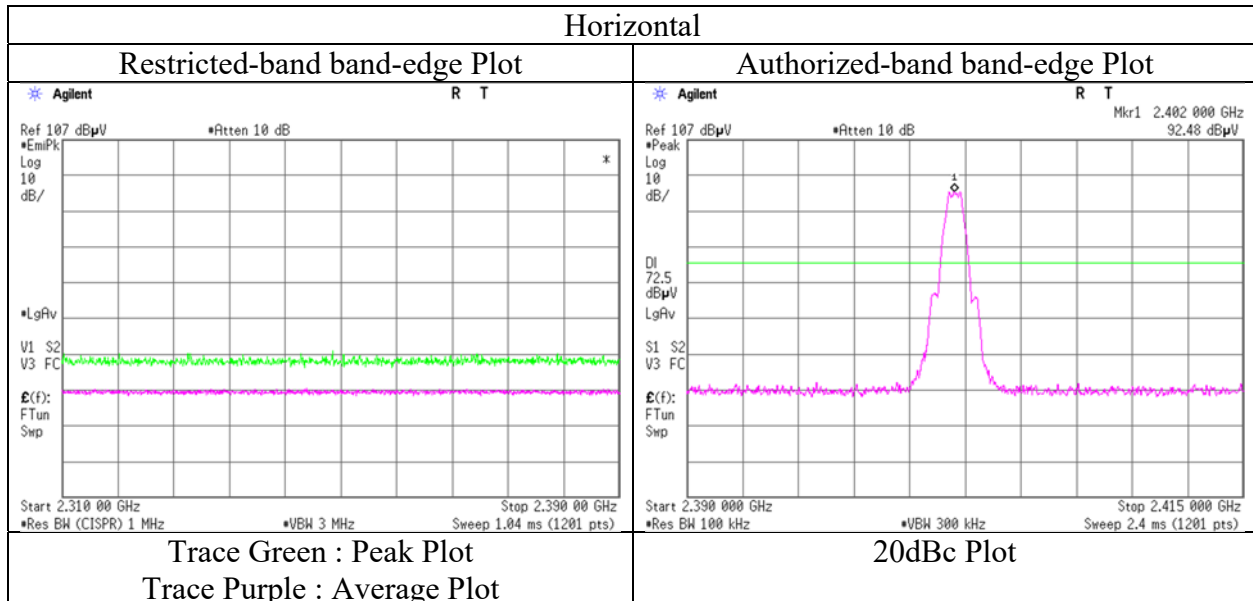
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 24, 2020
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 GHz)
Mode	Tx BT LE 2402 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.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 28, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx BT LE 2440MHz		

(* 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.	30.574	QP	22.20	18.41	6.46	32.18	0.00	14.89	40.0	25.1	100	0	
Hori.	943.824	QP	20.00	22.00	10.96	30.70	0.00	22.26	46.0	23.7	100	0	
Hori.	4880.000	PK	48.56	31.71	6.62	42.93	2.41	46.37	73.9	27.5	116	154	
Hori.	7320.000	PK	48.31	37.38	8.14	43.49	2.41	52.75	73.9	21.1	150	0	
Hori.	9760.000	PK	47.82	39.33	9.31	42.97	2.41	55.90	73.9	18.0	150	0	
Hori.	7320.000	AV	39.07	37.38	8.14	43.49	2.41	43.51	53.9	10.3	150	0	floor noise
Hori.	9760.000	AV	38.69	39.33	9.31	42.97	2.41	46.77	53.9	7.1	150	0	floor noise
Vert.	31.046	QP	22.40	18.22	6.47	32.18	0.00	14.91	40.0	25.0	100	0	
Vert.	59.427	QP	23.10	8.35	6.56	32.16	0.00	5.85	40.0	34.1	100	197	
Vert.	62.906	QP	26.80	7.65	6.49	32.15	0.00	8.79	40.0	31.2	100	205	
Vert.	63.510	QP	27.70	7.51	6.48	32.15	0.00	9.54	40.0	30.4	100	193	
Vert.	65.237	QP	29.80	7.19	6.48	32.15	0.00	11.32	40.0	28.6	100	122	
Vert.	66.416	QP	29.70	6.96	6.55	32.15	0.00	11.06	40.0	28.9	100	181	
Vert.	67.026	QP	29.60	6.84	6.59	32.15	0.00	10.88	40.0	29.1	100	164	
Vert.	898.676	QP	20.30	21.89	10.82	31.06	0.00	21.95	46.0	24.0	100	0	
Vert.	4880.000	PK	47.83	31.71	6.62	42.93	2.41	45.64	73.9	28.2	155	266	
Vert.	7320.000	PK	48.64	37.38	8.14	43.49	2.41	53.08	73.9	20.8	150	0	
Vert.	9760.000	PK	48.88	39.33	9.31	42.97	2.41	56.96	73.9	16.9	150	0	
Vert.	7320.000	AV	38.99	37.38	8.14	43.49	2.41	43.43	53.9	10.4	150	0	floor noise
Vert.	9760.000	AV	38.61	39.33	9.31	42.97	2.41	46.69	53.9	7.2	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.	4880.000	AV	39.35	31.71	6.62	42.93	4.36	2.41	41.52	53.9	12.3	
Vert.	4880.000	AV	38.79	31.71	6.62	42.93	4.36	2.41	40.96	53.9	12.9	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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.

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Radiated Spurious Emission

Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 28, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	30.945	QP	22.20	18.26	6.47	32.18	0.00	14.75	40.0	25.2	100	0	
Hori.	952.449	QP	19.90	22.07	10.99	30.62	0.00	22.34	46.0	23.6	100	0	
Hori.	2483.500	PK	48.92	28.24	14.16	41.69	2.41	52.04	73.9	21.8	129	156	
Hori.	4960.000	PK	48.13	31.96	6.67	42.94	2.41	46.23	73.9	27.6	137	161	
Hori.	7440.000	PK	48.45	37.56	8.21	43.60	2.41	53.03	73.9	20.8	150	0	
Hori.	9920.000	PK	48.01	39.18	9.42	42.78	2.41	56.24	73.9	17.6	150	0	
Hori.	7440.000	AV	39.07	37.56	8.21	43.60	2.41	43.65	53.9	10.2	150	0	floor noise
Hori.	9920.000	AV	39.03	39.18	9.42	42.78	2.41	47.26	53.9	6.6	150	0	floor noise
Vert.	35.537	QP	23.10	16.46	6.55	32.17	0.00	13.94	40.0	26.0	100	0	
Vert.	64.701	QP	28.80	7.28	6.47	32.15	0.00	10.40	40.0	29.6	100	166	
Vert.	65.504	QP	30.80	7.14	6.49	32.15	0.00	12.28	40.0	27.7	100	201	
Vert.	65.843	QP	30.80	7.07	6.52	32.15	0.00	12.24	40.0	27.7	100	254	
Vert.	66.416	QP	31.30	6.96	6.55	32.15	0.00	12.66	40.0	27.3	100	242	
Vert.	67.565	QP	31.70	6.81	6.61	32.15	0.00	12.97	40.0	27.0	100	194	
Vert.	68.171	QP	31.50	6.76	6.65	32.15	0.00	12.76	40.0	27.2	100	179	
Vert.	951.282	QP	19.90	22.06	10.98	30.63	0.00	22.31	46.0	23.6	100	0	
Vert.	2483.500	PK	48.02	28.24	14.16	41.69	2.41	51.14	73.9	22.7	111	214	
Vert.	4960.000	PK	48.55	31.96	6.67	42.94	2.41	46.65	73.9	27.2	148	274	
Vert.	7440.000	PK	48.54	37.56	8.21	43.60	2.41	53.12	73.9	20.7	150	0	
Vert.	9920.000	PK	48.96	39.18	9.42	42.78	2.41	57.19	73.9	16.7	150	0	
Vert.	7440.000	AV	38.82	37.56	8.21	43.60	2.41	43.40	53.9	10.5	150	0	floor noise
Vert.	9920.000	AV	38.34	39.18	9.42	42.78	2.41	46.57	53.9	7.3	150	0	floor noise

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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	38.41	28.24	14.16	41.69	4.36	2.41	45.89	53.90	8.0	*1)
Hori.	4960.000	AV	39.27	31.96	6.67	42.94	4.36	2.41	41.73	53.90	12.1	
Vert.	2483.500	AV	37.63	28.24	14.16	41.69	4.36	2.41	45.11	53.90	8.7	*1)
Vert.	4960.000	AV	38.71	31.96	6.67	42.94	4.36	2.41	41.17	53.90	12.7	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.41\text{ dB}$

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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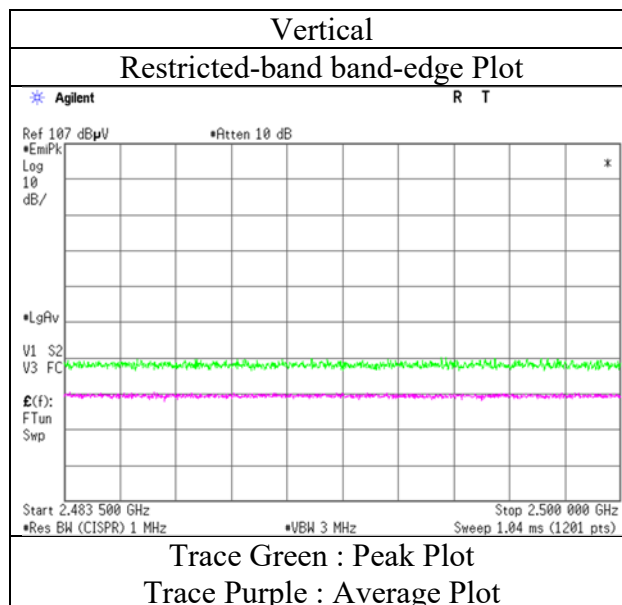
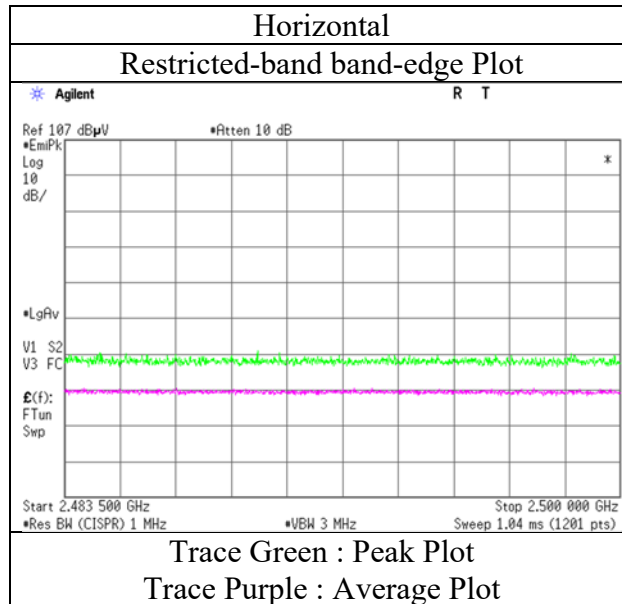
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Radiated Spurious Emission (Reference Plot for band-edge)

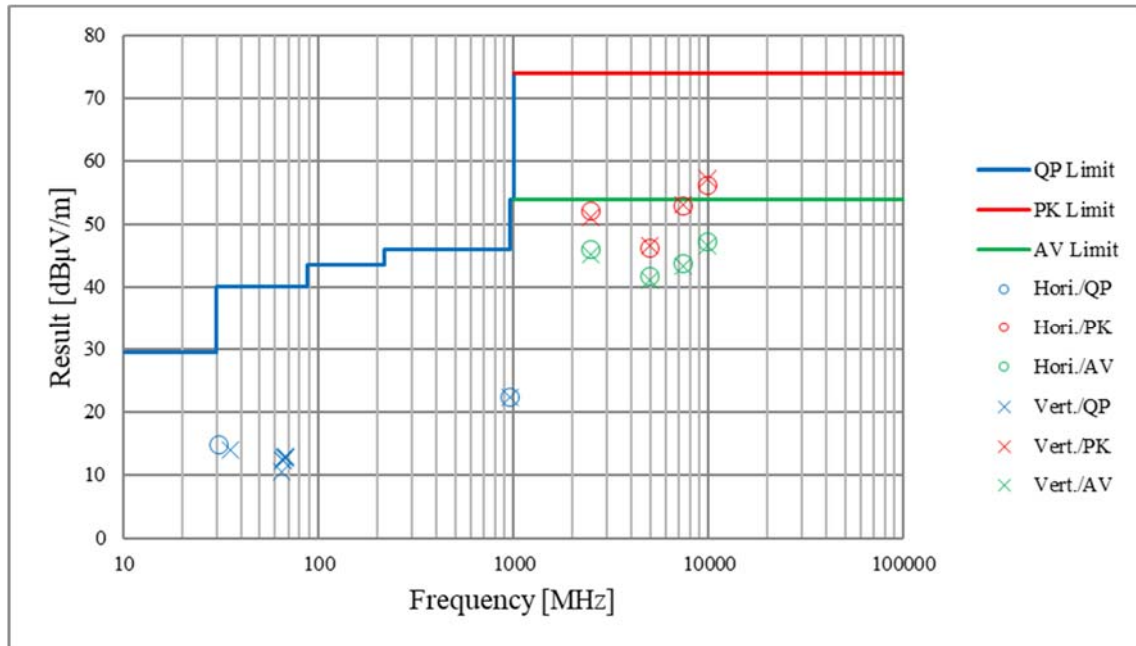
Report No.	13282400S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 24, 2020
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami
	(1 GHz - 2.8 GHz)
Mode	Tx BT LE 2480 MHz



* 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)

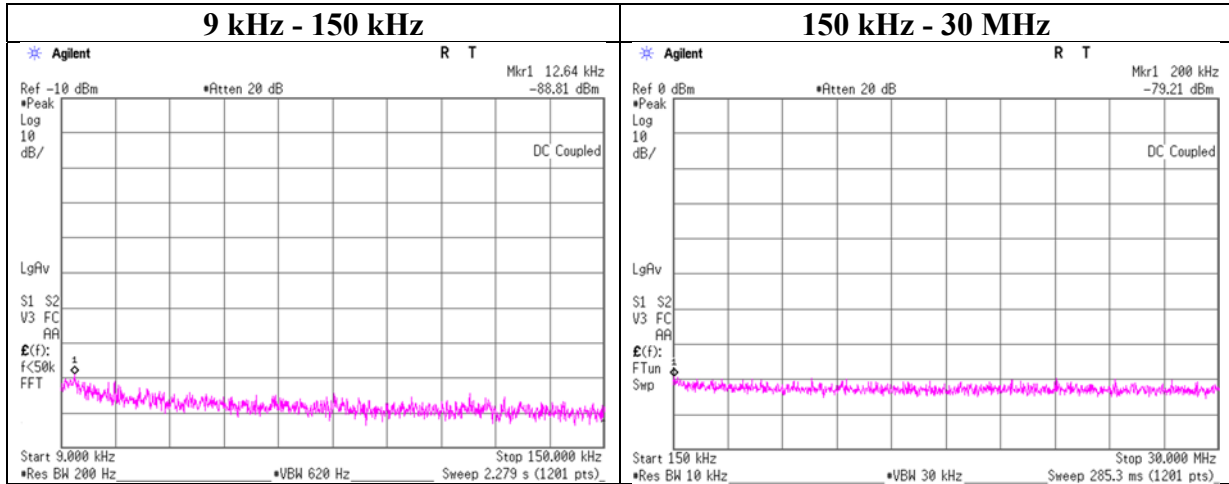
Report No.	13282400S-A-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	April 28, 2020	April 24, 2020	April 26, 2020
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 30 % RH	24 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(30 MHz - 1000 MHz)	(1 GHz - 13 GHz)	(13 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz		



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

Conducted Spurious Emission

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 22, 2020
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Takahiro Kawakami
Mode	Tx 11g 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
12.64	-88.8	0.01	9.5	2.0	1	-77.3	300	6.0	-16.0	45.5	61.5	
200.00	-79.2	0.01	9.5	2.0	1	-67.7	300	6.0	-6.4	21.5	27.9	

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

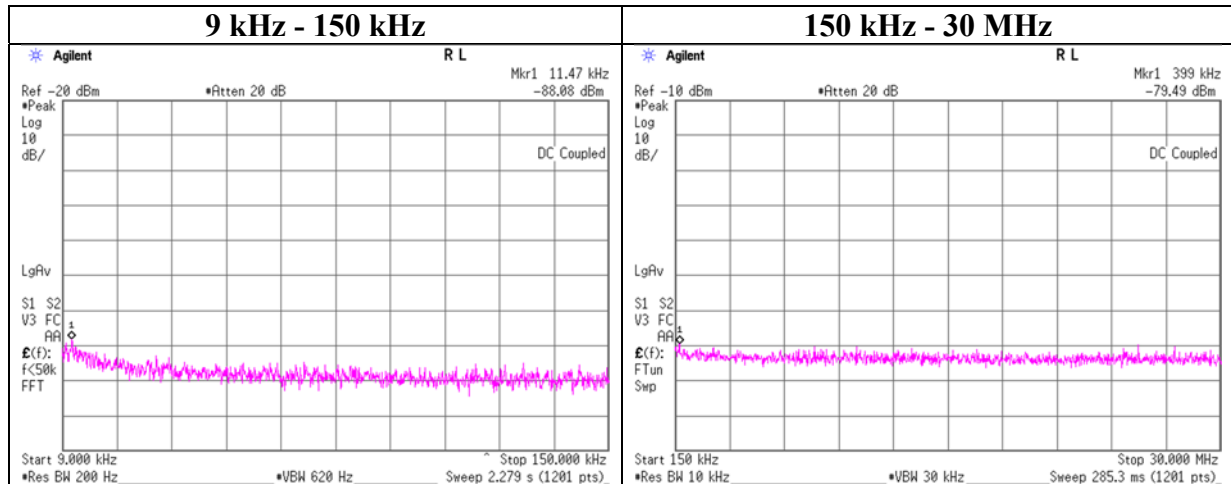
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

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.

Conducted Spurious Emission

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 22, 2020
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Takahiro Kawakami
Mode	Tx BT LE 2402 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
11.47	-88.1	0.01	9.5	2.0	1	-76.5	300	6.0	-15.3	46.4	61.7	
399.00	-79.5	0.02	9.5	2.0	1	-67.9	300	6.0	-6.7	15.5	22.2	

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

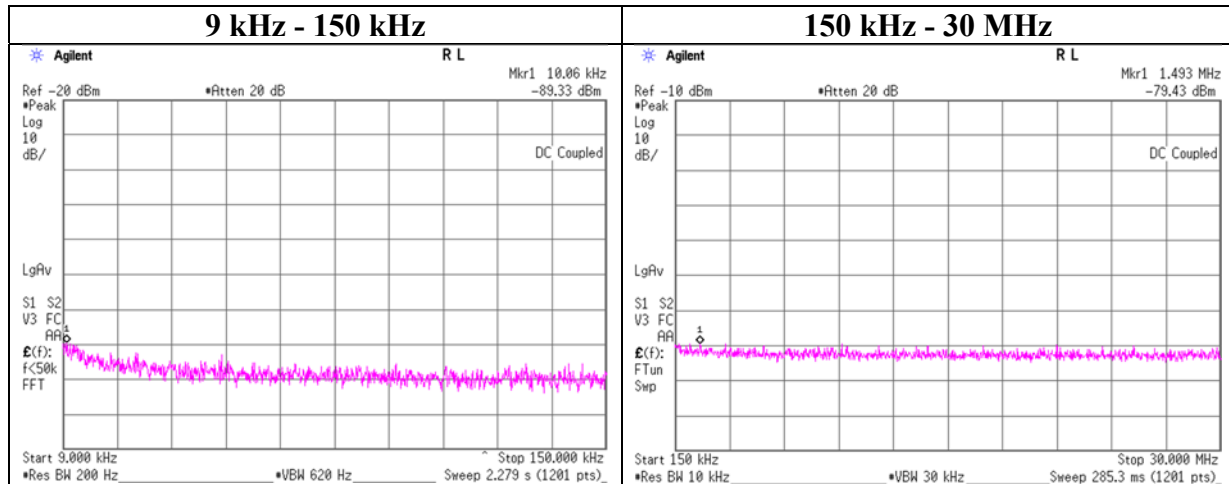
$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

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.

Conducted Spurious Emission

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 22, 2020
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Takahiro Kawakami
Mode	Tx BT LE 2440 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
10.06	-89.3	0.01	9.5	2.0	1	-77.8	300	6.0	-16.5	47.5	64.0	
1493.00	-79.4	0.03	9.5	2.0	1	-67.9	30	6.0	13.4	24.1	10.7	

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

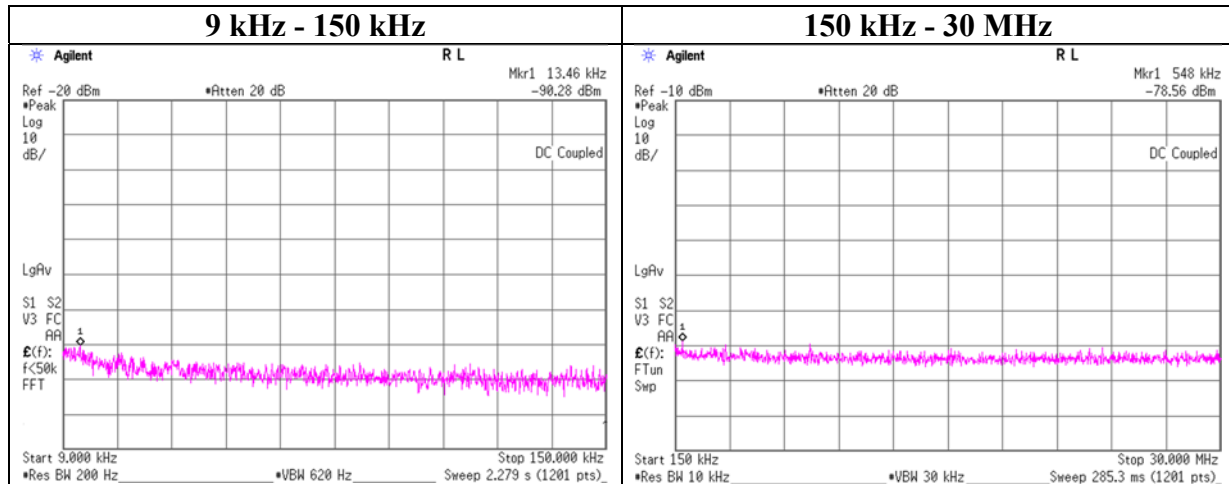
$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 22, 2020
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Takahiro Kawakami
Mode	Tx BT LE 2480 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
13.46	-90.3	0.01	9.5	2.0	1	-78.7	300	6.0	-17.5	45.0	62.5	
548.00	-78.6	0.02	9.5	2.0	1	-67.0	30	6.0	14.3	32.8	18.5	

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

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

N: Number of output

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

Power Density

Report No.	13282400S-A-R1
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	April 22, 2020
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Takahiro Kawakami
Mode	Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-16.43	1.44	9.63	-5.36	8.00	13.36
2437	-17.29	1.44	9.63	-6.22	8.00	14.22
2462	-16.67	1.45	9.63	-5.59	8.00	13.59

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-21.35	1.44	9.63	-10.28	8.00	18.28
2437	-21.98	1.44	9.63	-10.91	8.00	18.91
2462	-22.18	1.45	9.63	-11.10	8.00	19.10

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-23.22	1.44	9.63	-12.15	8.00	20.15
2437	-23.15	1.44	9.63	-12.08	8.00	20.08
2462	-23.90	1.45	9.63	-12.82	8.00	20.82

BT LE

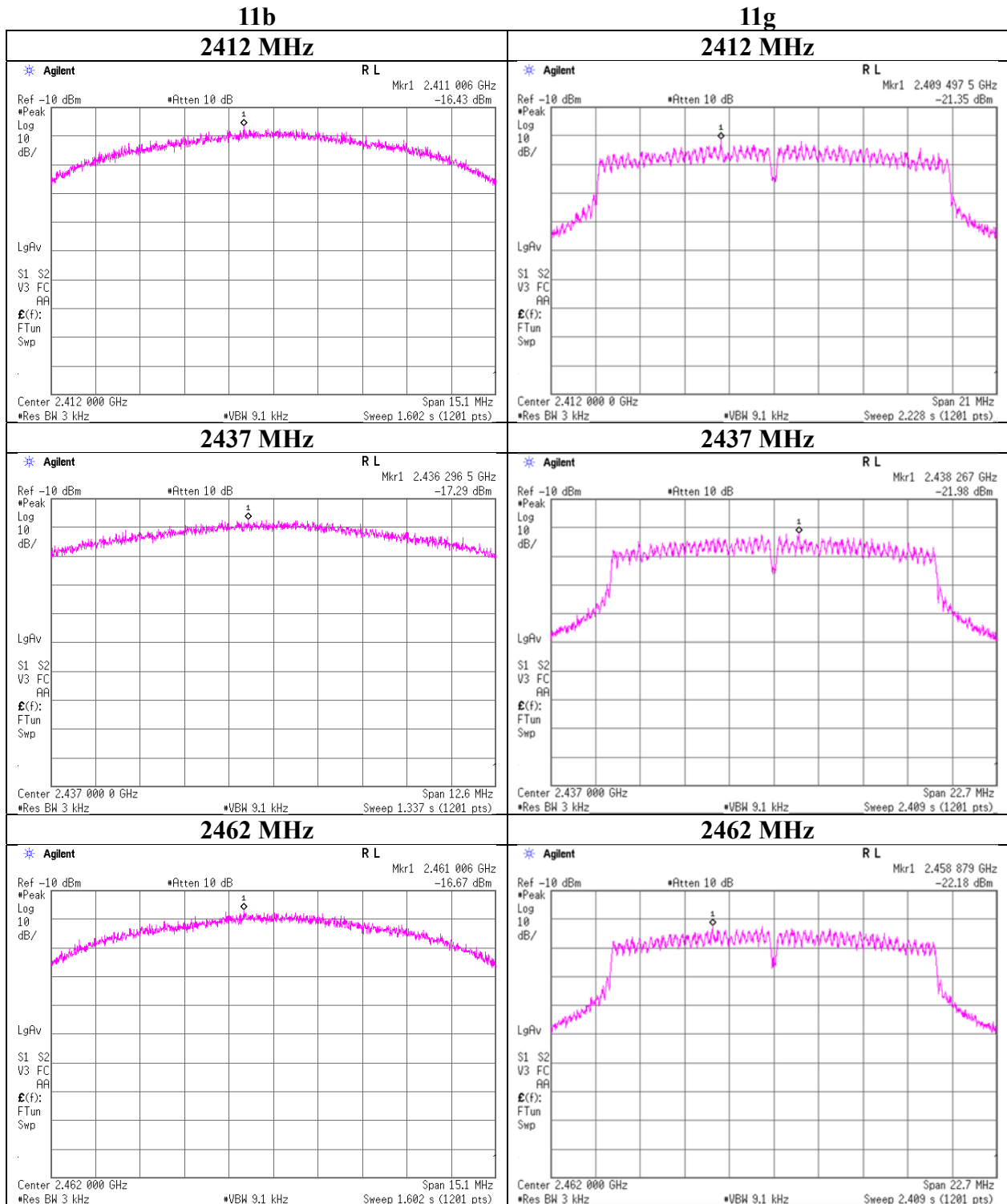
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-18.85	1.43	9.63	-7.79	8.00	15.79
2440	-18.86	1.44	9.63	-7.79	8.00	15.79
2480	-18.96	1.46	9.63	-7.87	8.00	15.87

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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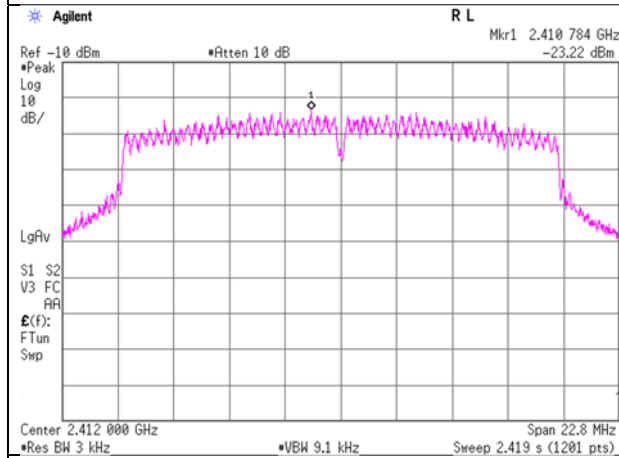
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Power Density

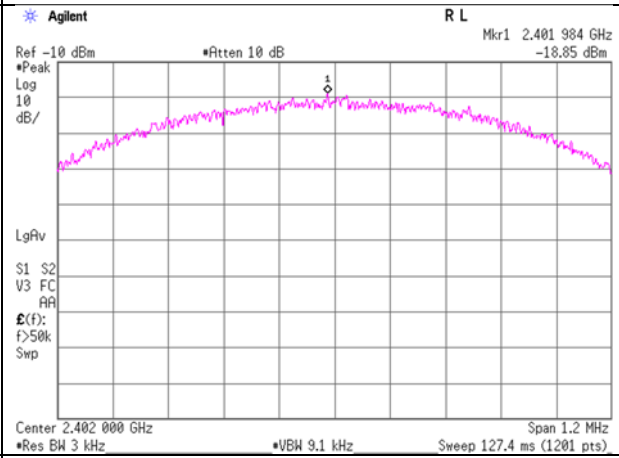
11n-20

2412 MHz

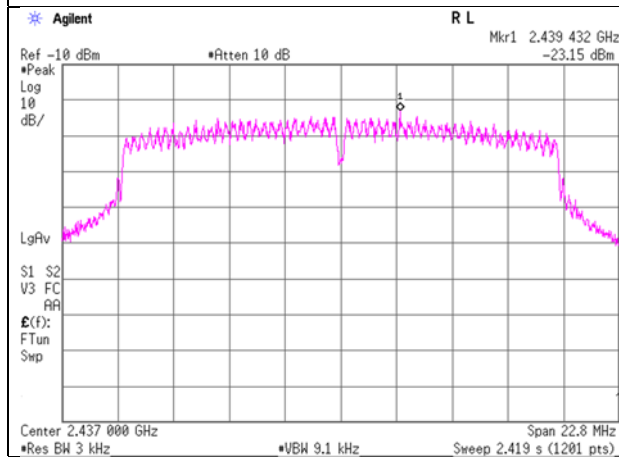


BT LE

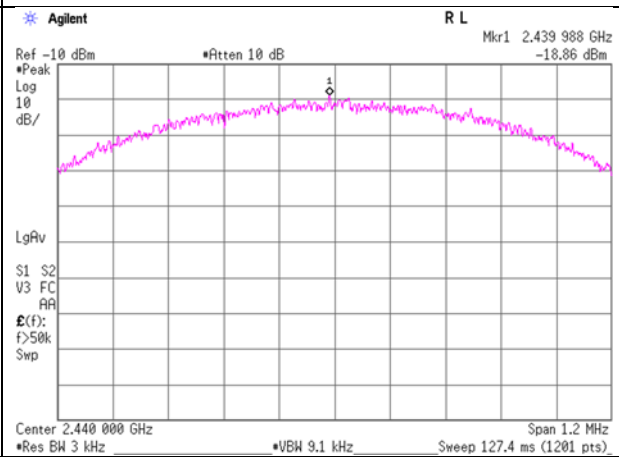
2402 MHz



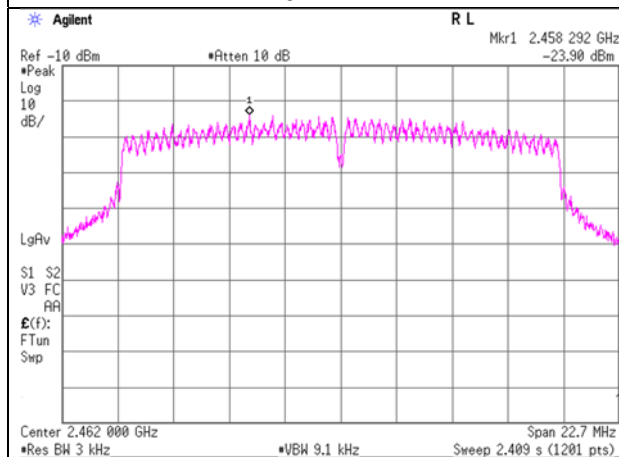
2437 MHz



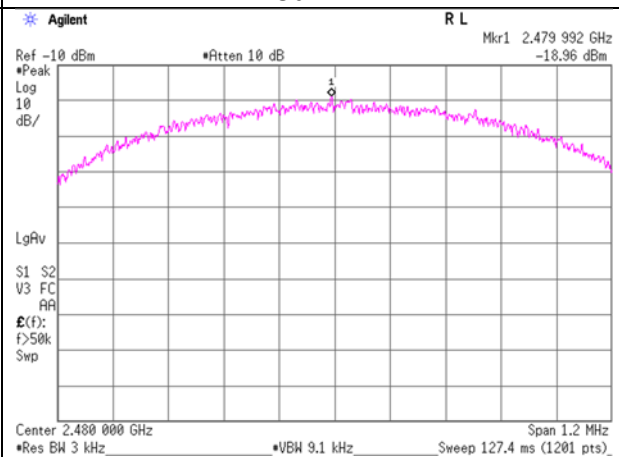
2440 MHz



2462 MHz



2480 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)
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
AT	SAT10-09	145132	Attenuator	Weinschel Corp.	54A-10	W5692	2019/11/05	12
AT	SCC-G13	145166	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	2019/12/12	12
AT	SOS-13	146321	Humidity Indicator	CUSTOM	CTH-202	Q.C.17	2019/12/19	12
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	SRENT-09	150461	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186392	2020/02/10	12
CE	SAT3-13	150923	Attenuator	JFW	50HF-003N	-	2020/01/30	12
CE	SCC-C9/C10/SRSE-03	145036	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271(RF Selector)	2020/04/12	12
CE	SLS-02	145539	LISN	Rohde & Schwarz	ENV216	100512	2020/02/18	12
CE	SOS-24	191841	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
CE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,M E,PE)	-	-	-
CE,RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
CE,RE	STS-03	146210	Digital Hitester	Hioki	3805-50	80997823	2019/10/01	12
RE	KBA-01	146343	Biconical Antenna	Schwarzbeck Mess - Elektronik	BBA9106	1748	2019/06/05	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2020/04/12	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-04	145127	Pre Amplifier	Toyo Corporation	TPA0118-36	2072554	2019/06/04	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	SAT10-05	145136	Attenuator(above 1GHz)	Keysight Technologies Inc	8493C-010	74864	2019/11/06	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2020/02/21	12

Test equipment(2/ 2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
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)	2020/04/12	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2020/03/04	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	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-G44	168300	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800375/4A	2019/11/11	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2020/05/12	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	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-01	145531	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	UHALP9108A	UHALP 9108-A 0888	2019/06/05	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2019/08/08	12
RE	STR-06	146208	Test Receiver	Rohde & Schwarz	ESCI	101259	2020/04/01	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: CE: Conducted Emission test
RE: Radiated Emission test
AT: Antenna Terminal Conducted test