




RADIO TEST REPORT


Test Report No. : 13705875S-E-R2

Applicant : RICOH IMAGING COMPANY, LTD.
Type of EUT : Digital Camera
Model Number of EUT : R05010
FCC ID : 2ACZS-R05010
Test regulation : FCC Part 15 Subpart C: 2021
Test Result : Complied (Refer to SECTION 3)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13705875S-E-R1. 13705875S-E-R1 is replaced with this report.

Date of test: April 17 to May16, 2018 and
March 1 to 19, 2021

Representative test engineer: 
Kenichi Adachi
Engineer
Consumer Technology Division

Approved by: 
Toyokazu Imamura
Leader
Consumer Technology Division



CERTIFICATE 1266.03

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

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Shonan EMC Lab.

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REVISION HISTORY

Original Test Report No.: 13705875S-E

Revision	Test report No.	Date	Page revised	Contents																																										
- (Original)	13705875S-E	April 27, 2021	-	-																																										
1	13705875S-E-R1	June 8, 2021	6	Addition of clock frequency to the Radio Specification: "Clock frequency (Maximum) : 200 MHz"																																										
			7	Update of Test Specification: From "FCC Part 15 final revised on January 12, 2021 and effective February 11, 2021" To "FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021" *The revision does not affect the test result conducted before its effective date."																																										
2	13705875S-E-R2	June 24, 2021	6	Modification of clock frequency list: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3">From</th> </tr> <tr> <th>Clock</th> <th>Oscillation Source</th> <th>Frequency [MHz]</th> </tr> </thead> <tbody> <tr> <td>ASIC (Main Clock)</td> <td>Crystal Unit</td> <td>40</td> </tr> <tr> <td>ASIC (Sub Clock)</td> <td>RTC</td> <td>0.0032768</td> </tr> <tr> <td>ASIC (Maximum Internal Clock)</td> <td>-</td> <td>2160</td> </tr> <tr> <td>RTC</td> <td>Crystal Unit</td> <td>0.0032768</td> </tr> <tr> <td>CPU (Sub Clock)</td> <td>Crystal Unit</td> <td>0.0032768</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3">To</th> </tr> <tr> <th>Clock</th> <th>Oscillation Source</th> <th>Frequency [MHz]</th> </tr> </thead> <tbody> <tr> <td>ASIC (Main Clock)</td> <td>Crystal Unit</td> <td>40</td> </tr> <tr> <td>ASIC (Sub Clock)</td> <td>RTC</td> <td>0.032768</td> </tr> <tr> <td>ASIC (Maximum Internal Clock)</td> <td>-</td> <td>2160</td> </tr> <tr> <td>RTC</td> <td>Crystal Unit</td> <td>0.032768</td> </tr> <tr> <td>CPU (Sub Clock)</td> <td>Crystal Unit</td> <td>0.032768</td> </tr> </tbody> </table>	From			Clock	Oscillation Source	Frequency [MHz]	ASIC (Main Clock)	Crystal Unit	40	ASIC (Sub Clock)	RTC	0.0032768	ASIC (Maximum Internal Clock)	-	2160	RTC	Crystal Unit	0.0032768	CPU (Sub Clock)	Crystal Unit	0.0032768	To			Clock	Oscillation Source	Frequency [MHz]	ASIC (Main Clock)	Crystal Unit	40	ASIC (Sub Clock)	RTC	0.032768	ASIC (Maximum Internal Clock)	-	2160	RTC	Crystal Unit	0.032768	CPU (Sub Clock)	Crystal Unit	0.032768
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Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name : RICOH IMAGING COMPANY, LTD.
Address : 1-3-6, Nakamagome, Ohta-ku, Tokyo 143-8555, Japan
Telephone Number : +81-50-3534-5213
Facsimile Number : +81-3-3775-8531
Contact Person : Kenji Daigo

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 : Digital Camera
Model Number : R05010
Serial Number : Refer to SECTION 4.2
Rating : DC 5 V (USB)
 DC 3.6 V (Battery)
Receipt Date : April 17, 2018 (Sample for WLAN AT test)
 February 28, 2021
Country of Mass-production : Vietnam
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: R05010 (referred to as the EUT in this report) is a Digital Camera.

The clock frequencies used in the EUT:

Clock	Oscillation Source	Frequency [MHz]
ASIC (Main Clock)	Crystal Unit	40
ASIC (Sub Clock)	RTC	0.032768
ASIC (Maximum Internal Clock)	-	2160
RTC	Crystal Unit	0.032768
CPU (Sub Clock)	Crystal Unit	0.032768
CPU (Maximum Internal Clock)	-	32
SRIC (Main Clock)	ASIC	24.576
SRIC (Maximum Internal Clock)	-	196.608
DPU (Main Clock)	ASIC	27
Motor Driver (Main Clock)	ASIC	6.75
Audio Codec (Main Clock)	ASIC	24.576
WLAN/BLE Module (Main Clock)	ASIC	200
eMMC (Main Clock)	ASIC	187.5
SDRAM (Main Clock)	ASIC	930
Preprocessor (Main Clock)	ASIC	54
Preprocessor (Maximum Internal Clock)	-	252
CMOS Image Sensor (Main Clock)	ASIC	54
LCD (Main Clock)	ASIC	27
SD (Main Clock)	ASIC	200
AV Processor (Main Clock)	ASIC	27
USB2.0	ASIC	240
USB3.1	ASIC	2500
DisplayPort	AV Processor	2700

Radio Specification

WLAN

Radio Type : Transceiver
Frequency of Operation : 2412 MHz - 2462 MHz
Modulation : DSSS: DBPSK, DQPSK, CCK / OFDM: BPSK, QPSK, 16QAM, 64QAM
Antenna type : Pattern Antenna ($\lambda/4$ Monopole Antenna)
Antenna Gain : -2.1 dBi
Operating Temperature : 0 deg. C to +40 deg. C
Clock frequency (Maximum) : 200 MHz

Bluetooth Low Energy

Equipment Type : Transceiver
Frequency of Operation : 2402 MHz – 2480 MHz
Type of Modulation : GFSK
Antenna Type : Pattern Antenna ($\lambda/4$ Monopole Antenna)
Antenna Gain : -2.1 dBi
Operating Temperature : 0 deg. C to +40 deg. C
Clock frequency (Maximum) : 200 MHz

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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 May 3, 2021 and effective July 2, 2021
*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	20.6 dB 0.41186 MHz, AV, N, Tx, BTLE, 2480 MHz, AC Adapter	Complied a)	Conducted
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 *1)
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 *1)
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 *1)
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	4.7 dB 9848.000 MHz, AV, Vert. Tx 11n-20 2462 MHz	Complied# e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
<p>Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) As for WLAN testing, refer to the result of Antenna terminal test at the test report No.: 12212627S-H-R1. *2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.</p> <p>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)</p> <p>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.</p>					

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

FCC Part 15.31 (e)

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

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

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

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

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.
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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.56dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	2.7 dB	2.7 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	4.8 dB	4.8 dB	4.8 dB	-
	6 GHz-18 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.3 dB	5.3 dB	5.3 dB	-
	1 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 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	1.4 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.6 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.2 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.91 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.2 dB
Spurious emission (Conducted) below 1GHz	0.87 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.96 dB
Spurious emission (Conducted) 3 GHz-18 GHz	3.0 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.2 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %
Temperature_SCH-01	0.95 deg.C.
Humidity_SCH-01	0.83 %
Temperature_SCH-02	2.0 deg.C.
Humidity_SCH-02	6.6 %
Voltage	0.86 %

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3.5 Test Location

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Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401

A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

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

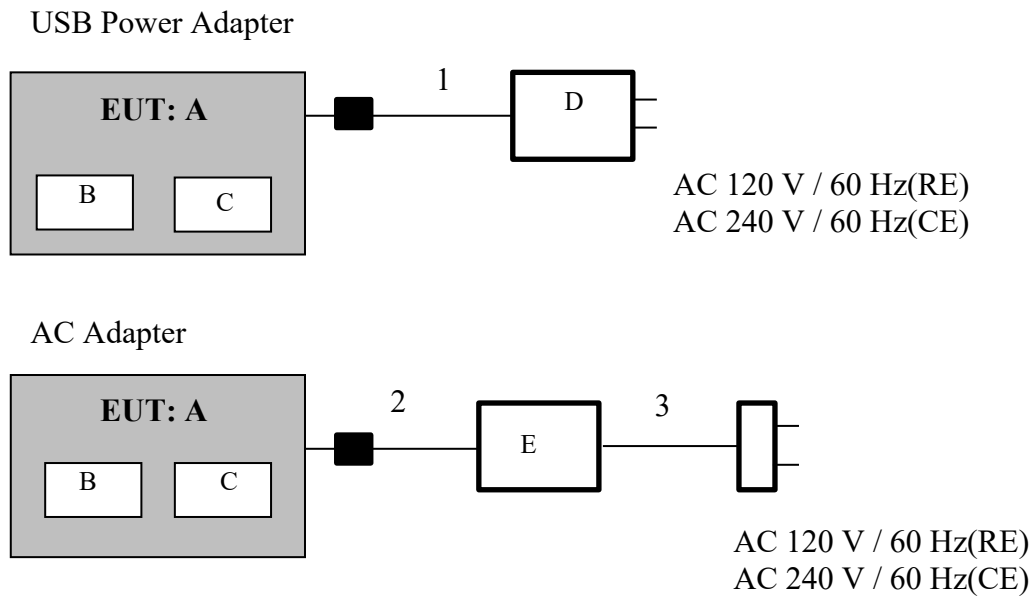
Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	6 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 1 PN9
Bluetooth Low Energy (BT LE)	PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b, 11g, 11n-20 : 9.5 dBm BT LE : Fixed Software: WLAN Test(Antenna Terminal Conducted test):CPU Ver.00.21.00.05 DSP Ver.00.93.21.02 (Date: 2018.4.17, Storage location: EUT memory) WLAN Test (other than Antenna Terminal Conducted test): Ver011_0001 (Date: 2021.3.1, Storage location: EUT memory) BT LE Test: Ver091_2101 (Date: 2021.3.17, 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)

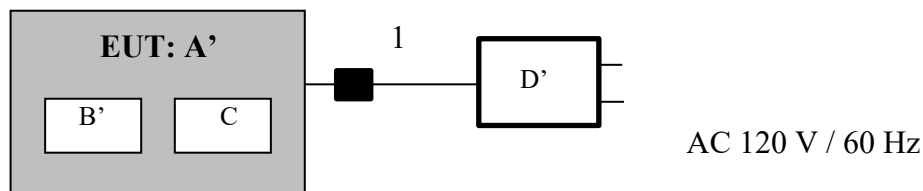
Test Item	Operating Mode	Tested frequency
Conducted Emission	Tx 11g	2462 MHz
	Tx BT LE	2402 MHz
		2440 MHz
2480 MHz		
Spurious Emission	Tx 11b	2412 MHz
	Tx 11g	2437 MHz
	Tx 11n-20	2462 MHz
	Tx BT LE	2402 MHz
2440 MHz		
2480 MHz		
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	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

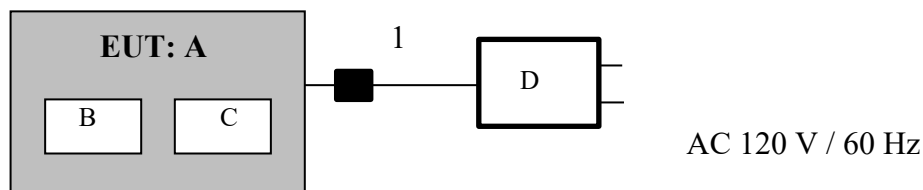
Conducted Emission, Radiated Spurious Emission



Antenna Terminal Conducted test (WLAN)



Antenna Terminal Conducted test (BT LE)



■ : Standard ferrite core

- *Cabling and setup were taken into consideration and test data was taken under worse case conditions.
- *For conducted emission test, pre-check had been done with AC 240 V and 120 V and tested at the worst case 240 V.
- *The core is a standard ferrite core attached to DC and USB cable and not used to reduce the noise from the EUT. The core is equivalent to the one which is attached to the DC and USB cable of host device the EUT is installed.
- *As for WLAN testing, refer to the result of Antenna terminal test at the test report No.: 12212627S-H-R1.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Digital Camera	R05010	0000067 *1) 0000053 *2)	RICOH IMAGING COMPANY, LTD.	EUT
A'	Digital Camera	R02010	0000010 *3)	RICOH IMAGING COMPANY, LTD.	EUT
B	SDHC Memory Card	SD-K08G	1508UL7636T	TOSHIBA	-
B'	SDHC Memory Card	SD-K08G	1422UL3928T	TOSHIBA	-
C	LI-ION Battery	DB-110	-	RICOH IMAGING COMPANY, LTD.	-
D	USB Power Adapter	AC-U2	U2-19	RICOH IMAGING COMPANY, LTD.	-
D'	USB Power Adapter	AC-U2	U2-11	RICOH IMAGING COMPANY, LTD.	-
E	AC Adapter	D-AC166	ESD-1	RICOH IMAGING COMPANY, LTD.	-

*1) Used for Conducted Emission and Radiated Spurious Emission.

*2) Used for Antenna Terminal conducted test (BT LE)

*3) Used for Antenna Terminal conducted test (WLAN)

List of cable used

No.	Item	Length (m)	Shield	Remarks
1	USB	0.7	Shielded	-
2	DC	1.0	Unshielded	-
3	AC	1.8	Unshielded	-

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.

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 in a Semi Anechoic Chamber.

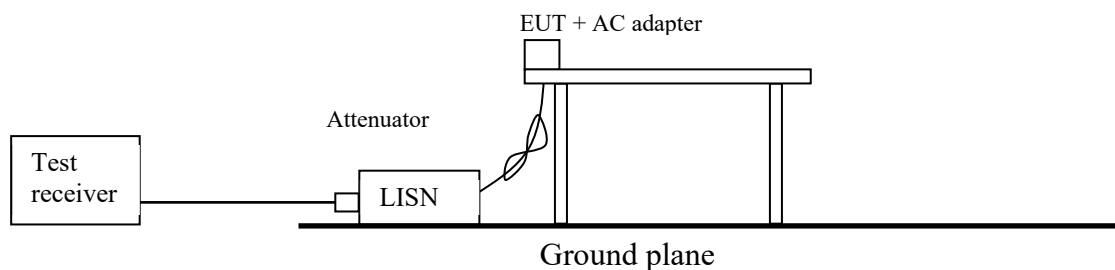
The EUT via AC adapter was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

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, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

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

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	11,12,2,5,2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

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

UL Japan, Inc.

Shonan EMC Lab.

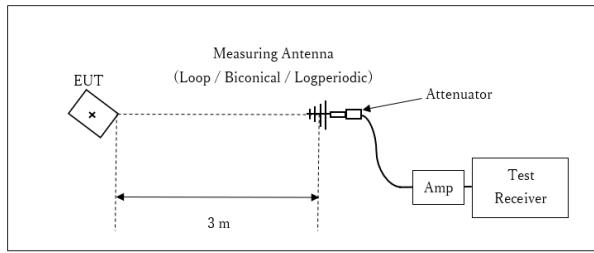
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Figure 2: Test Setup

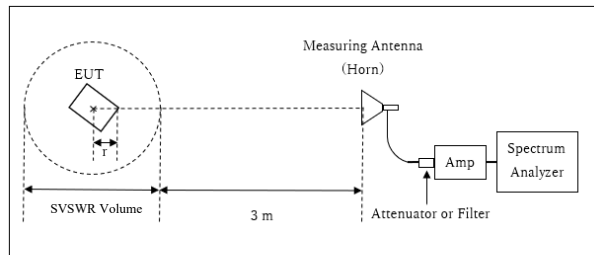
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

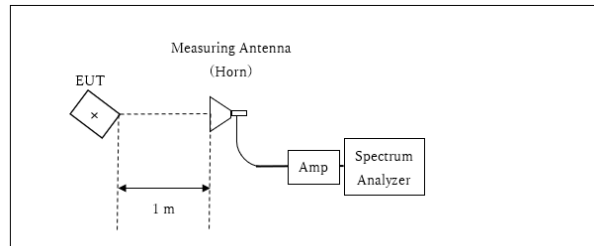


r : Radius of an outer periphery of EUT
 × : Center of turn table

Distance Factor: $20 \times \log(3.95 \text{ m} / 3.0 \text{ m}) = 2.39 \text{ dB}$
 * Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.95 \text{ m}$

SVSWR Volume : 2.0 m
 (SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.05 \text{ m}$

10 GHz – 26.5 GHz



× : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$
 *Test Distance: 1 m

- 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.

WLAN

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz - 2.8 GHz)	Spurious (2.8 GHz - 13 GHz)	Spurious (13 GHz - 18 GHz)	Spurious (18 GHz - 26.5 GHz)
Horizontal	X	Z	X	X	X	X
Vertical	Y	Z	Y	Y	X	X

Bluetooth Low Energy (BT LE)

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz - 2.8 GHz)	Spurious (2.8 GHz - 10 GHz)	Spurious (10 GHz - 18 GHz)	Spurious (18 GHz - 26.5 GHz)
Horizontal	X	Z	X	X	X	X
Vertical	Y	Z	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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6 dB Bandwidth	50 MHz (WLAN) 10 MHz (BT LE)	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	10 kHz	30 kHz				

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

*2) Reference data

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

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

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

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

*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

DATA OF CONDUCTED EMISSION TEST

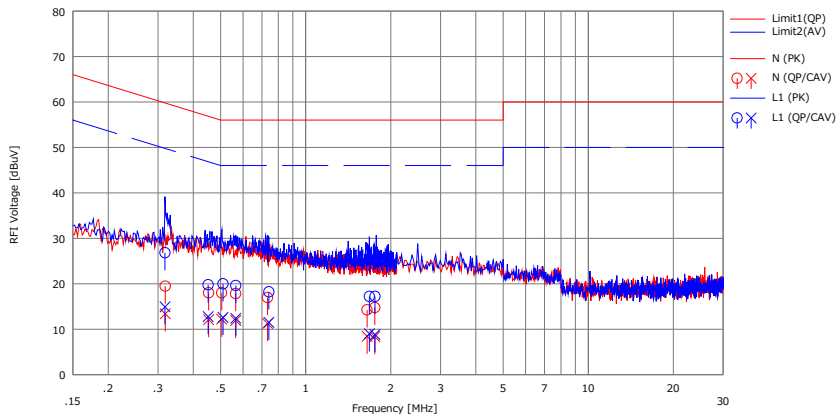
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2021/03/18

Mode : Tx, 11g, 2462 MHz
Power : AC 240 V / 60 Hz(AC adapter input)
Temp./Humi. : 23 deg.C / 30 %RH

Remarks : USB Power Adapter

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : takahiro kawakami



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		(QP) [dBuV]	(CAV) [dBuV]		(QP) [dBuV]	(CAV) [dBuV]	(QP) [dBuV]	(AV) [dBuV]	(QP) [dB]	(AV) [dB]		
1	0.31843	6.90	0.80	12.58	19.48	13.38	59.75	49.75	40.2	36.3	N	
2	0.45355	5.40	-0.50	12.60	18.00	12.10	56.81	46.81	38.8	34.7	N	
3	0.50450	5.40	-0.40	12.60	18.00	12.20	56.00	46.00	38.0	33.8	N	
4	0.56542	5.20	-0.70	12.62	17.82	11.92	56.00	46.00	38.1	34.0	N	
5	0.73307	4.30	-1.40	12.65	16.95	11.25	56.00	46.00	39.0	34.7	N	
6	1.64880	1.50	-4.30	12.74	14.24	8.44	56.00	46.00	41.7	37.5	N	
7	1.75600	2.00	-4.40	12.76	14.76	8.36	56.00	46.00	41.2	37.6	N	
8	0.31771	14.20	2.30	12.63	26.83	14.93	59.77	49.77	32.9	34.8	L1	
9	0.45152	7.10	0.10	12.67	19.77	12.77	56.85	46.85	37.0	34.0	L1	
10	0.80959	7.30	-0.10	12.68	19.98	12.58	56.00	46.00	36.0	33.4	L1	
11	0.56576	6.90	-0.30	12.70	19.60	12.40	56.00	46.00	36.4	33.6	L1	
12	0.74054	5.50	-1.20	12.71	18.21	11.51	56.00	46.00	37.7	34.4	L1	
13	1.68073	4.40	-3.80	12.80	17.20	9.00	56.00	46.00	38.8	37.0	L1	
14	1.75930	4.40	-4.00	12.81	17.21	8.81	56.00	46.00	38.7	37.1	L1	

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

DATA OF CONDUCTED EMISSION TEST

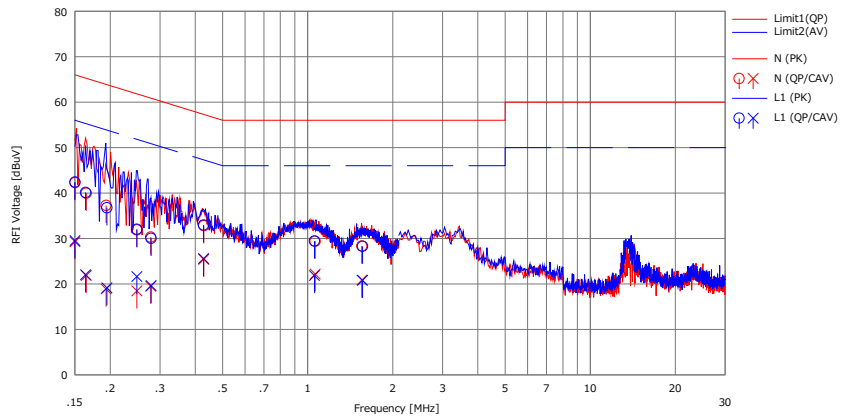
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
 Date : 2021/03/18

Mode : Tx, 11g, 2462 MHz
Power : AC 240 V / 60 Hz(AC adapter input)
Temp./Humi. : 23 deg.C / 30 %RH

Remarks : AC Adapter

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : takahiro kawakami



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	29.70	16.70	12.56	42.26	29.26	66.00	56.00	23.7	26.7	N	
2	0.16450	27.40	9.30	12.56	39.96	21.86	65.23	55.23	25.2	33.3	N	
3	0.19345	24.70	6.30	12.58	37.28	18.88	63.89	53.89	26.6	35.0	N	
4	0.24838	19.30	5.90	12.57	31.87	18.47	61.81	51.81	29.9	33.3	N	
5	0.27821	17.70	6.90	12.58	30.28	19.48	60.87	50.87	30.5	31.3	N	
6	0.42857	20.20	12.80	12.61	32.81	25.41	57.28	47.28	24.4	21.8	N	
7	1.06242	16.70	9.50	12.68	29.38	22.18	56.00	46.00	26.6	23.8	N	
8	1.55341	15.60	8.10	12.74	28.34	20.84	56.00	46.00	27.6	25.1	N	
9	0.15000	29.80	16.90	12.61	42.41	29.51	66.00	56.00	23.5	26.4	L1	
10	0.16375	27.50	9.40	12.62	40.12	22.02	65.27	55.27	25.1	33.2	L1	
11	0.19463	24.10	6.50	12.65	36.75	19.15	63.84	53.84	27.0	34.6	L1	
12	0.24846	19.40	9.00	12.62	32.02	21.62	61.81	51.81	29.7	30.1	L1	
13	0.27901	17.40	7.00	12.62	30.02	19.62	60.85	50.85	30.8	31.2	L1	
14	0.42802	20.30	12.90	12.66	32.96	25.56	57.29	47.29	24.3	21.7	L1	
15	1.05670	16.70	9.10	12.73	29.43	21.83	56.00	46.00	26.5	24.1	L1	
16	1.56390	15.50	8.00	12.78	28.28	20.78	56.00	46.00	27.7	25.2	L1	

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

DATA OF CONDUCTED EMISSION TEST

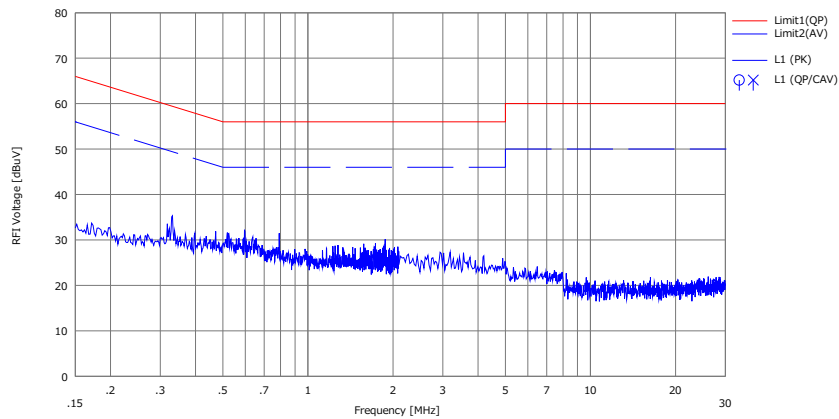
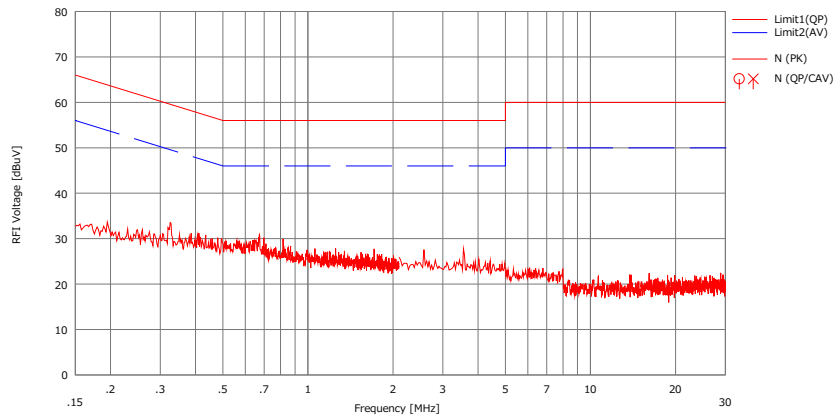
UL Japan, Inc. Shonan EMC Lab. No.1 Semi-Anechoic Chamber
 Date : 2021/03/19

Mode : Tx, BTLE, 2402 MHz
Power : AC 240 V / 60 Hz(AC adapter input)
Temp./Humi. : 23 deg.C / 30 %RH

Remarks : USB Power Adapter

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : takahiro kawakami



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

DATA OF CONDUCTED EMISSION TEST

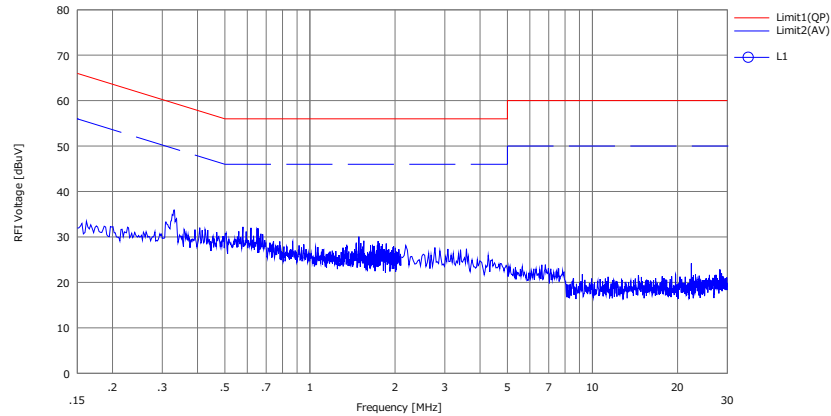
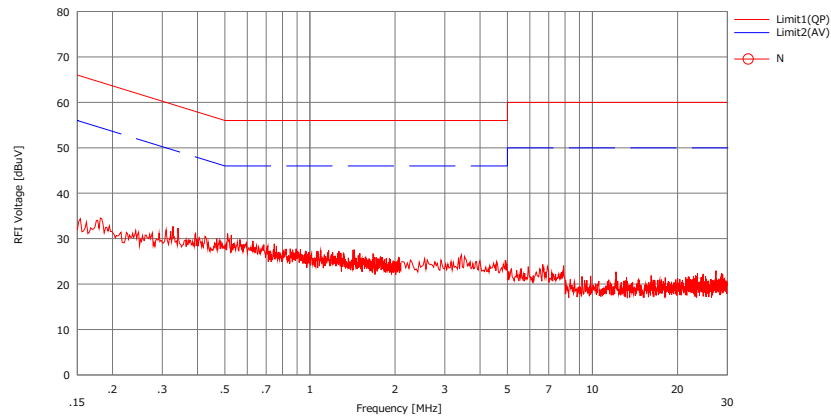
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2021/03/19

Mode : Tx, BTLE, 2440 MHz
Power : AC 240 V / 60 Hz(AC adapter input)
Temp./Humi. : 23 deg.C / 30 %RH

Remarks : USB Power Adapter

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : takahiro kawakami

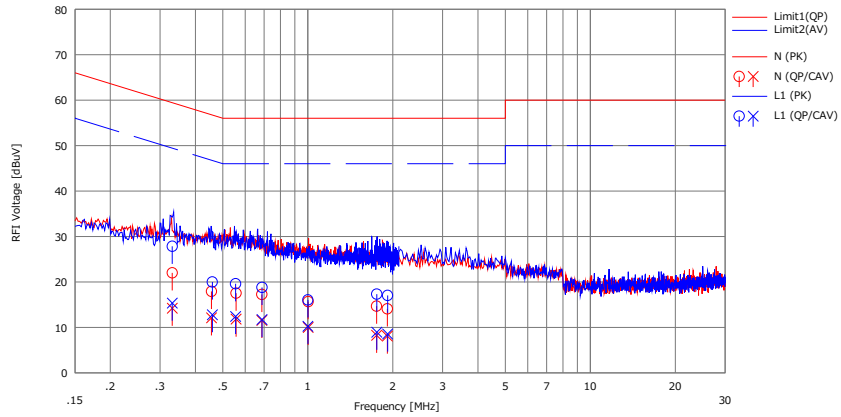


Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): SLS-02

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
 Date : 2021/03/19

Mode : Tx, BTLE, 2480 MHz
Power : AC 240 V / 60 Hz(AC adapter input)
Temp./Humi. : 23 deg.C / 30 %RH
Remarks : USB Power Adapter
Limit : FCC_Part 15 Subpart C(15.207)
Engineer : takahiro kawakami



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	0.33142	9.40	1.60	12.59	21.99	14.19	59.42	49.42	37.4	35.2	N	
2	0.45612	5.30	-0.50	12.60	17.90	12.10	56.76	46.76	38.8	34.6	N	
3	0.56730	4.90	-0.80	12.61	17.51	11.81	56.00	46.00	38.4	34.1	N	
4	0.68775	4.60	-1.10	12.64	17.24	11.54	56.00	46.00	38.7	34.4	N	
5	1.00260	3.00	-2.70	12.67	15.67	9.97	56.00	46.00	40.3	36.0	N	
6	1.75208	1.90	-4.50	12.76	14.66	8.26	56.00	46.00	41.3	37.7	N	
7	1.91250	1.30	-4.70	12.77	14.07	8.07	56.00	46.00	41.9	37.9	N	
8	0.33148	15.20	2.70	12.64	27.84	15.34	59.41	49.41	31.5	34.0	L1	
9	0.46930	7.30	0.10	12.67	19.97	12.77	56.71	46.71	36.7	33.9	L1	
10	0.55528	6.90	-0.30	12.69	19.59	12.39	56.00	46.00	36.4	33.6	L1	
11	0.68890	6.10	-1.00	12.70	18.80	11.70	56.00	46.00	37.2	34.3	L1	
12	1.00045	3.30	-2.50	12.73	16.03	10.23	56.00	46.00	39.9	35.7	L1	
13	1.75410	4.50	-3.90	12.81	17.31	8.91	56.00	46.00	38.6	37.0	L1	
14	1.91580	4.20	-4.30	12.82	17.02	8.52	56.00	46.00	38.9	37.4	L1	

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

DATA OF CONDUCTED EMISSION TEST

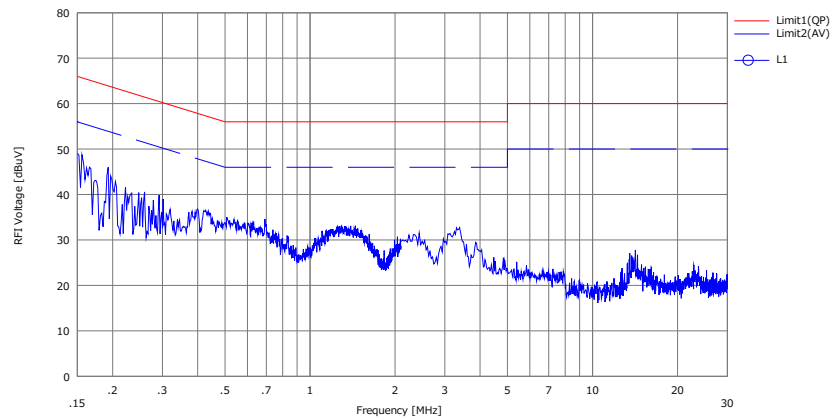
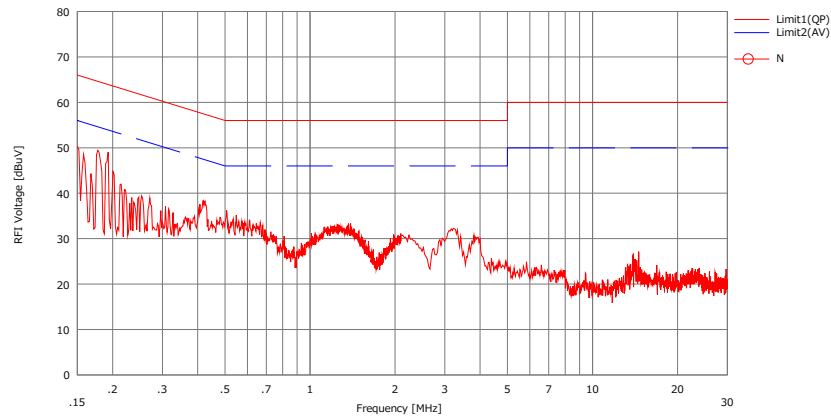
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2021/03/19

Mode : Tx, BTLE, 2402 MHz
Power : AC 240 V / 60 Hz(AC adapter input)
Temp./Humi. : 23 deg.C / 30 %RH

Remarks : AC Adapter

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : takahiro kawakami



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

DATA OF CONDUCTED EMISSION TEST

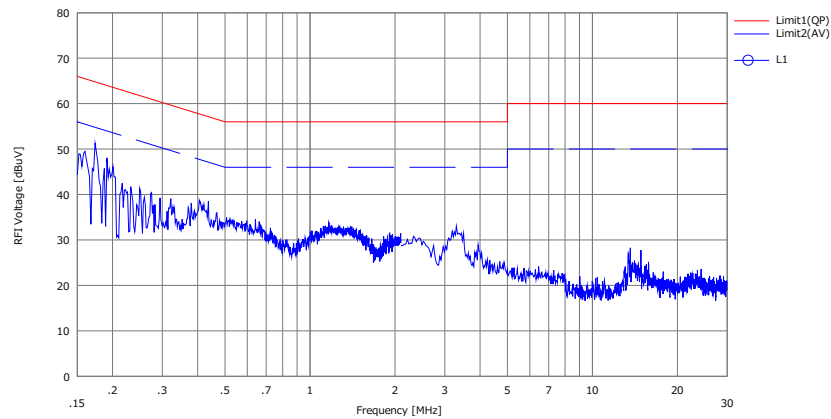
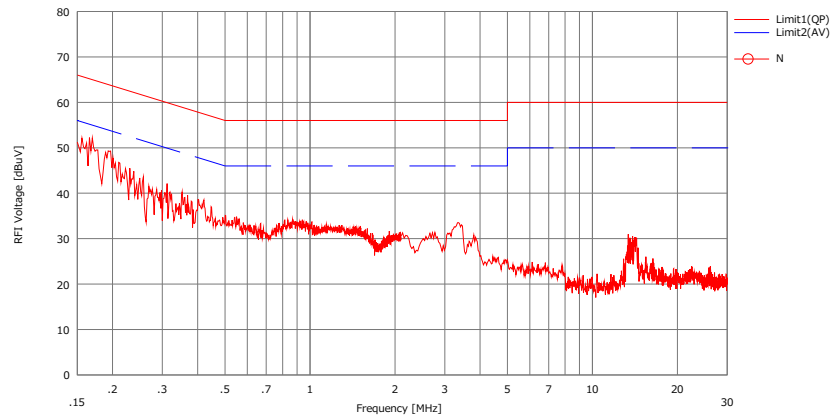
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2021/03/19

Mode : Tx, BTLE, 2440 MHz
Power : AC 240 V / 60 Hz(AC adapter input)
Temp./Humi. : 23 deg.C / 30 %RH

Remarks : AC Adapter

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : takahiro kawakami



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

DATA OF CONDUCTED EMISSION TEST

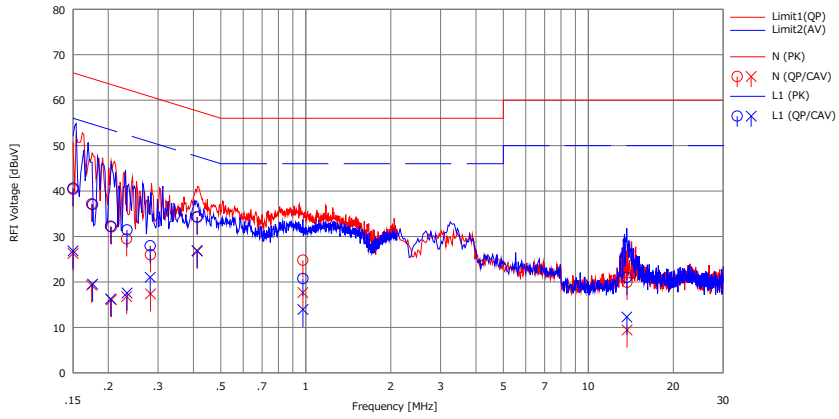
UL Japan, Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2021/03/19

Mode : Tx, BTLE, 2480 MHz
 Power : AC 240 V / 60 Hz(AC adapter input)
 Temp./Humi. : 23 deg.C / 30 %RH

Remarks : AC Adapter

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : takahiro kawakami



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	27.80	13.70	12.56	40.36	26.26	66.00	56.00	25.6	29.7	N	
2	0.17455	24.60	6.70	12.56	37.16	19.26	64.74	54.74	27.5	35.4	N	
3	0.20516	19.50	3.50	12.58	32.08	16.08	63.40	53.40	31.3	37.3	N	
4	0.23220	16.90	4.20	12.57	29.47	16.77	62.37	52.37	32.9	35.6	N	
5	0.28206	13.40	4.80	12.58	25.98	17.38	60.75	50.75	34.7	33.3	N	
6	0.41186	21.70	14.30	12.62	34.32	26.92	57.61	47.61	23.2	20.6	N	
7	0.97620	12.10	5.00	12.67	24.77	17.67	56.00	46.00	31.2	28.3	N	
8	13.70320	6.00	-4.50	13.92	19.92	9.42	60.00	50.00	40.0	40.5	N	
9	0.15000	28.00	14.20	12.61	40.61	26.81	66.00	56.00	25.3	29.1	L1	
10	0.17588	24.40	6.90	12.62	37.02	19.52	64.68	54.68	27.6	35.1	L1	
11	0.20374	19.60	3.60	12.65	32.25	16.25	63.46	53.46	31.2	37.2	L1	
12	0.23292	18.80	4.90	12.63	31.43	17.53	62.35	52.35	30.9	34.8	L1	
13	0.28136	15.30	8.40	12.62	27.92	21.02	60.78	50.78	32.8	29.7	L1	
14	0.41319	21.60	14.10	12.66	34.26	26.76	57.58	47.58	23.3	20.8	L1	
15	0.97708	8.00	1.20	12.73	20.73	13.93	56.00	46.00	35.2	32.0	L1	
16	13.68558	7.20	-1.50	13.78	20.98	12.28	60.00	50.00	39.0	37.7	L1	

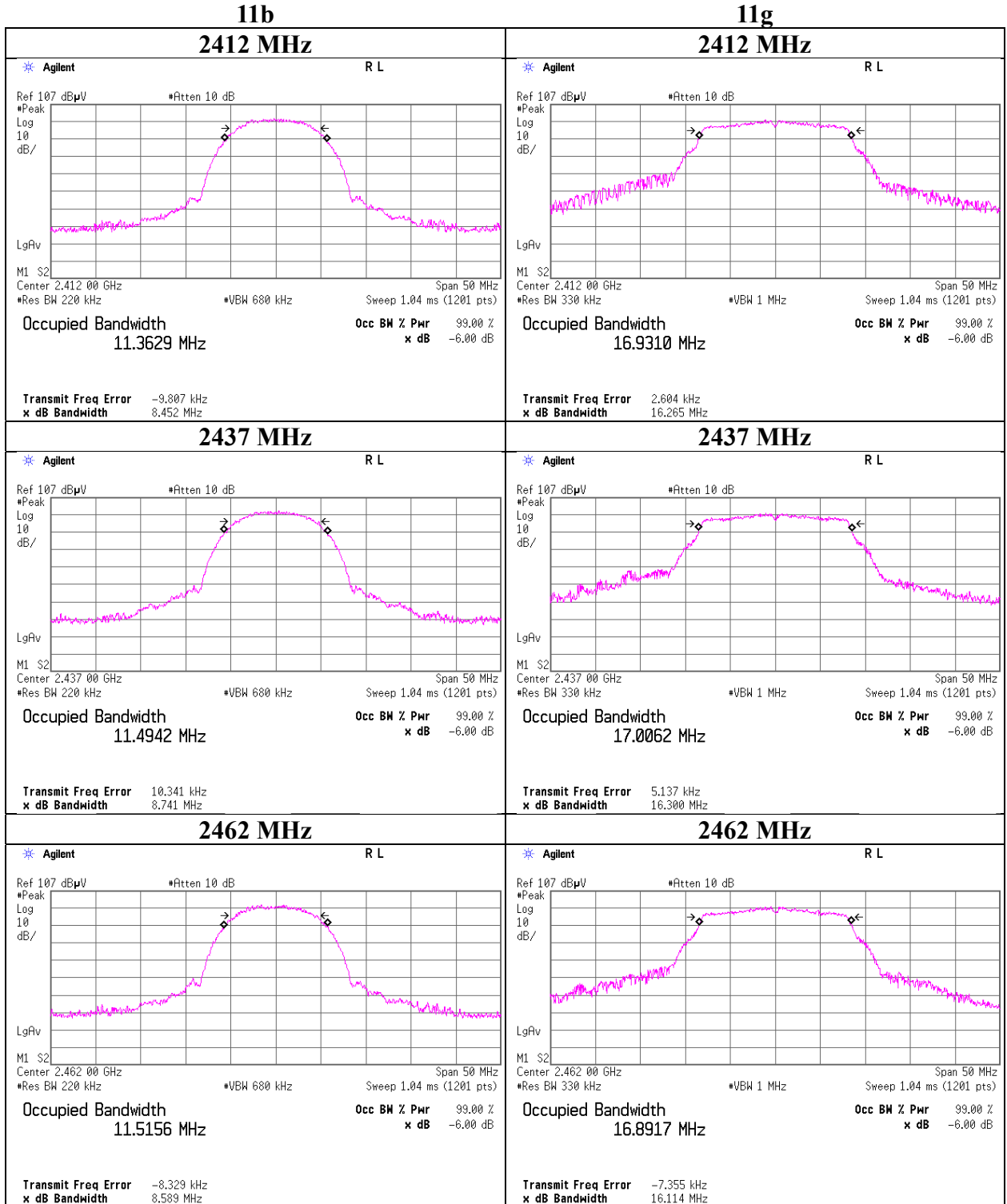
Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
 LISN(AMN): SLS-02

6 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13705875S-E-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date April 17, 2018 March 19, 2021
Temperature / Humidity 26 deg. C / 31 % RH 26 deg. C / 23 % RH
Engineer Yosuke Ishikawa Yusuke Tanikawara
Mode Tx

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
11b	2412	11362.9	8.466	> 0.5000
	2437	11494.2	9.024	> 0.5000
	2462	11515.6	8.595	> 0.5000
11g	2412	16931.0	16.318	> 0.5000
	2437	17006.2	16.348	> 0.5000
	2462	16891.7	16.102	> 0.5000
11n-20	2412	17889.7	17.166	> 0.5000
	2437	18010.3	17.000	> 0.5000
	2462	17897.9	15.743	> 0.5000
BT LE	2402	1057.9	0.724	> 0.5000
	2440	1056.5	0.724	> 0.5000
	2480	1058.2	0.723	> 0.5000

99 % Occupied Bandwidth



UL Japan, Inc.

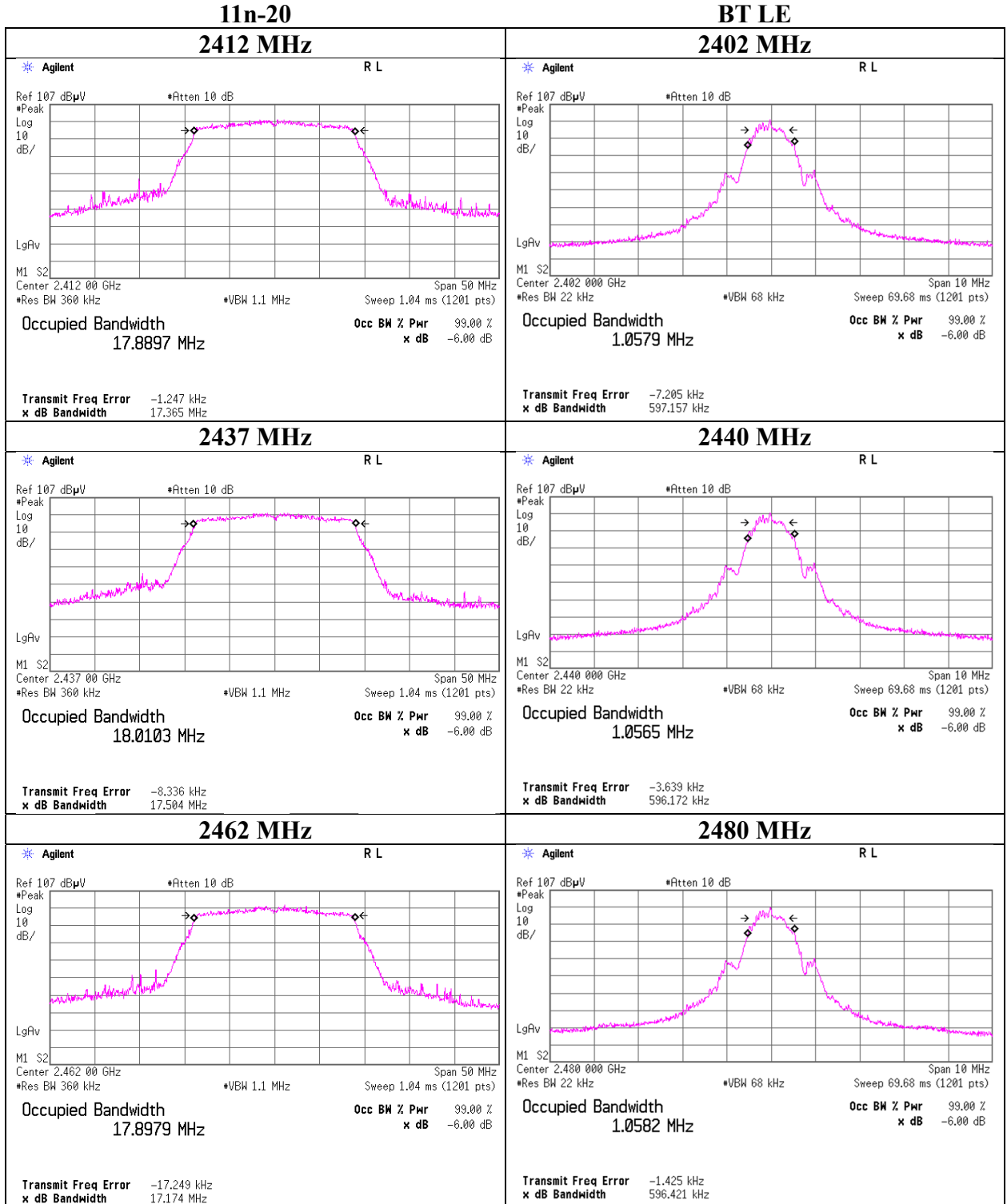
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99 % Occupied Bandwidth



UL Japan, Inc.

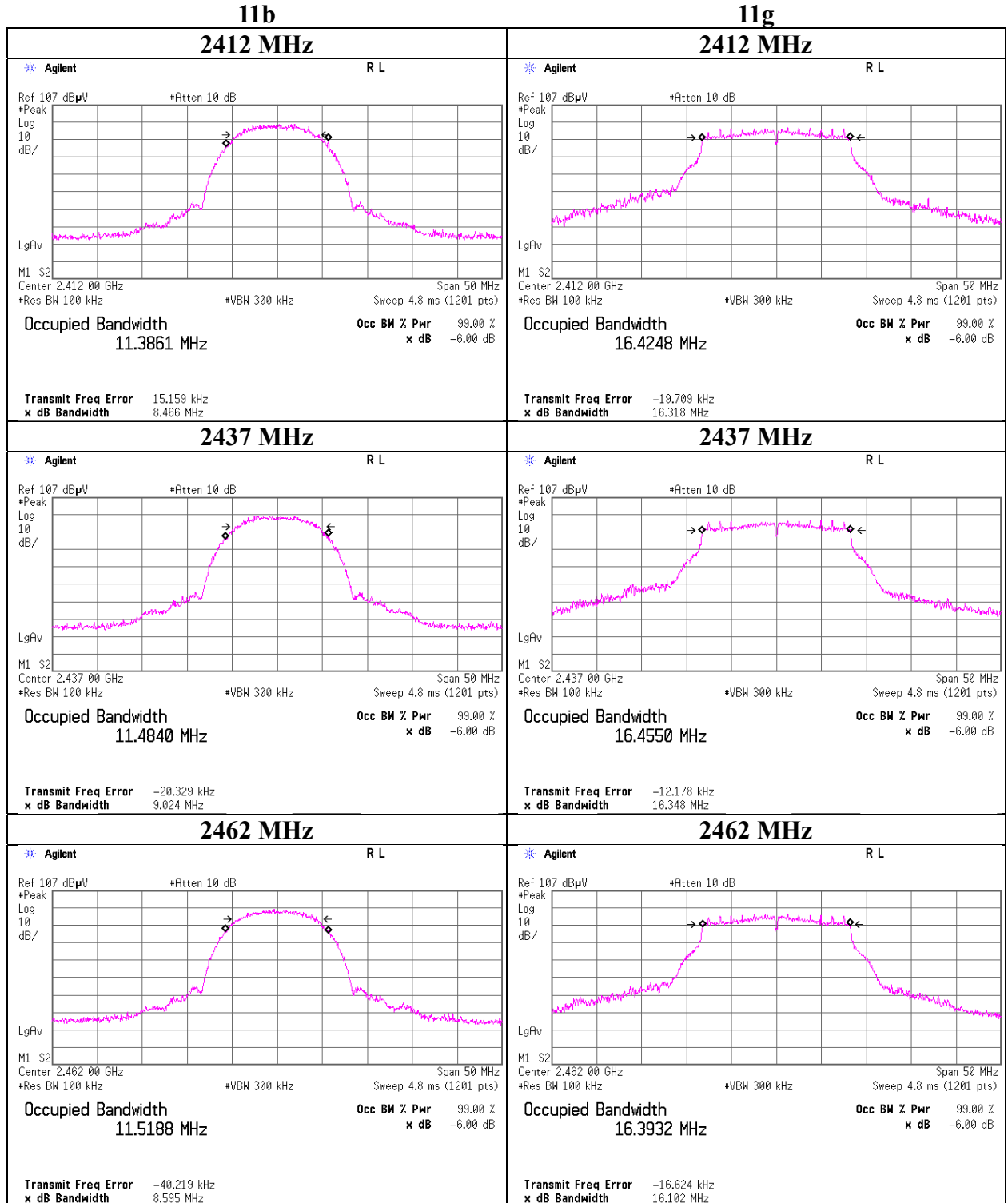
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

6 dB Bandwidth



UL Japan, Inc.

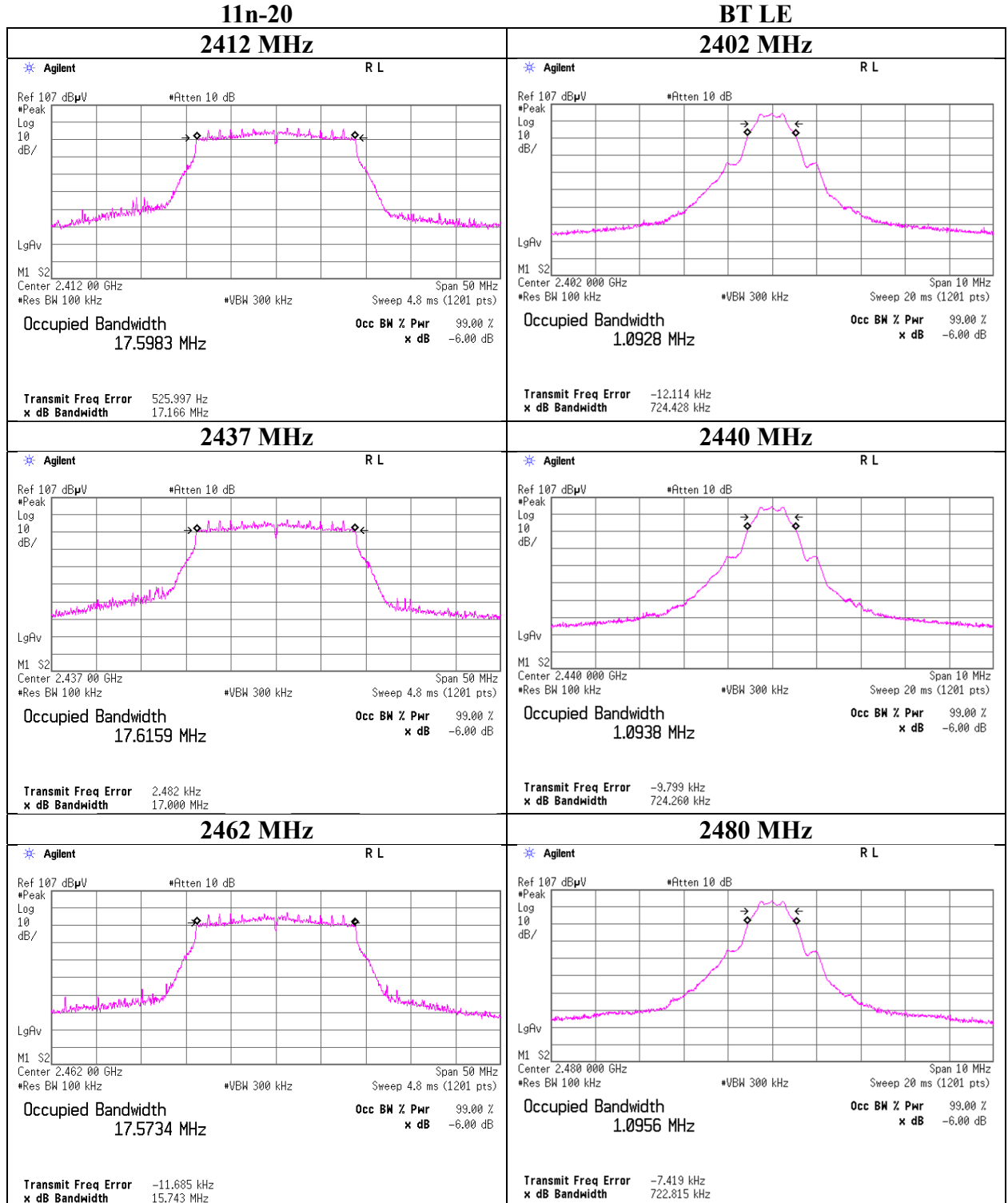
Shonan EMC Lab.

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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

6 dB Bandwidth



UL Japan, Inc.

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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Maximum Peak Output Power

Report No. 13705875S-E-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 17, 2018 April 18, 2018
Temperature / Humidity 26 deg. C / 31 % RH 23 deg. C / 44 % RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
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]			[dB]	[dBi]	[dBm]	[mW]	
2412	1.64	1.48	9.86	12.98	19.86	30.00	1000	17.02	-2.10	10.88	12.25	36.02	4000	25.14
2437	1.87	1.48	9.86	13.21	20.94	30.00	1000	16.79	-2.10	11.11	12.91	36.02	4000	24.91
2462	1.58	1.49	9.85	12.92	19.59	30.00	1000	17.08	-2.10	10.82	12.08	36.02	4000	25.20

Sample Calculation:

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

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

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

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	0.95	
2	1.65	
5.5	1.66	
11	1.87	*

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13705875S-E-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 17, 2018 April 18, 2018
Temperature / Humidity 26 deg. C / 31 % RH 23 deg. C / 44 % RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx 11g

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]			[dB]	[dBi]	[dBm]	[mW]	
2412	10.47	1.48	9.86	21.81	151.71	30.00	1000	8.19	-2.10	19.71	93.54	36.02	4000	16.31
2437	10.61	1.48	9.86	21.95	156.68	30.00	1000	8.05	-2.10	19.85	96.61	36.02	4000	16.17
2462	10.64	1.49	9.85	21.98	157.76	30.00	1000	8.02	-2.10	19.88	97.27	36.02	4000	16.14

Sample Calculation:

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

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

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

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	10.61	*
9	9.99	
12	9.31	
18	9.31	
24	9.46	
36	8.65	
48	10.51	
54	8.07	

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13705875S-E-R2
Test place Shonan EMC Lab. No.1 Measurement Room
Date April 17, 2018 April 18, 2018
Temperature / Humidity 26 deg. C / 31 % RH 23 deg. C / 44 % RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx 11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	10.48	1.48	9.86	21.82	152.05	30.00	1000	8.18	-2.10	19.72	93.76	36.02	4000	16.30
2437	10.62	1.48	9.86	21.96	157.04	30.00	1000	8.04	-2.10	19.86	96.83	36.02	4000	16.16
2462	10.45	1.49	9.85	21.79	151.01	30.00	1000	8.21	-2.10	19.69	93.11	36.02	4000	16.33

Sample Calculation:

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

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

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

2437 MHz

MCS Number	Reading [dBm]	Remark
0	10.30	
1	10.62	*
2	10.22	
3	9.62	
4	9.95	
5	10.56	
6	9.99	
7	9.71	

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13705875S-E-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date March 19, 2021
Temperature / Humidity 26 deg. C / 23 % RH
Engineer Yusuke Tanikawara
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-4.71	1.28	9.81	6.38	4.35	30.00	1000	23.62	-2.10	4.28	2.68	36.02	4000	31.74
2440	-4.93	1.28	9.82	6.17	4.14	30.00	1000	23.83	-2.10	4.07	2.55	36.02	4000	31.95
2480	-5.64	1.29	9.82	5.47	3.52	30.00	1000	24.53	-2.10	3.37	2.17	36.02	4000	32.65

Sample Calculation:

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

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

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

Average Output Power
(Reference data for RF Exposure)

Report No. 13705875S-E-R2
Test place Shonan EMC Lab. No.5 Shielded Room
Date April 17, 2018 March 19, 2021
Temperature / Humidity 26 deg. C / 31 % RH 26 deg. C / 23 % RH
Engineer Yosuke Ishikawa Yusuke Tanikawara
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	-2.36	1.48	9.86	8.98	7.91	0.04	9.02	7.98
2437	-2.48	1.48	9.86	8.86	7.69	0.04	8.90	7.76
2462	-2.85	1.49	9.85	8.49	7.06	0.04	8.53	7.13

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	-1.76	1.48	9.86	9.58	9.08	0.30	9.88	9.73
2437	-1.66	1.48	9.86	9.68	9.29	0.30	9.98	9.95
2462	-1.78	1.49	9.85	9.56	9.04	0.30	9.86	9.68

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	-2.60	1.48	9.86	8.74	7.48	0.31	9.05	8.04
2437	-1.88	1.48	9.86	9.46	8.83	0.31	9.77	9.48
2462	-2.21	1.49	9.85	9.13	8.18	0.31	9.44	8.79

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	-6.95	1.28	9.81	4.14	2.59	1.93	6.07	4.05
2440	-7.16	1.28	9.82	3.94	2.48	1.93	5.87	3.86
2480	-7.98	1.29	9.82	3.13	2.06	1.93	5.06	3.21

Sample Calculation:

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

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

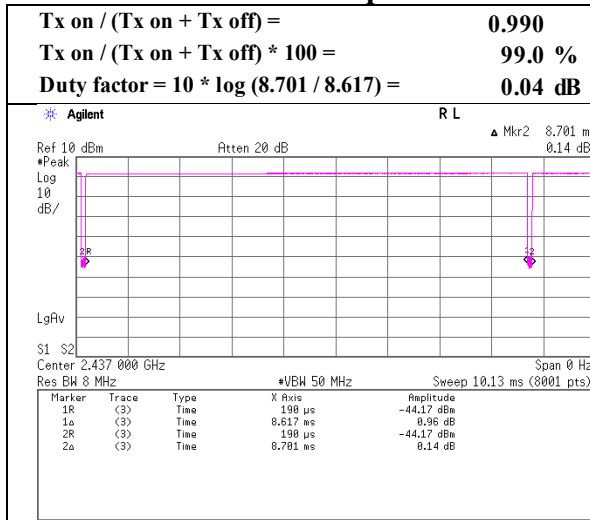
*The equipment and cables were not used for factor 0 dB of the data sheets.

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

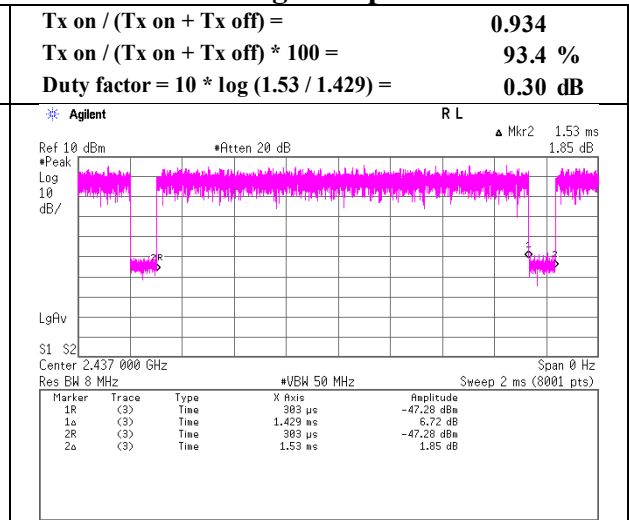
Burst rate confirmation(for Average Output Power)

Report No. 13705875S-E-R2
 Test place Shonan EMC Lab. No.5 Shielded Room
 Date April 17, 2018 March 19, 2021
 Temperature / Humidity 26 deg. C / 31 % RH 26 deg. C / 23 % RH
 Engineer Yosuke Ishikawa Yusuke Tanikawara
 Mode Tx

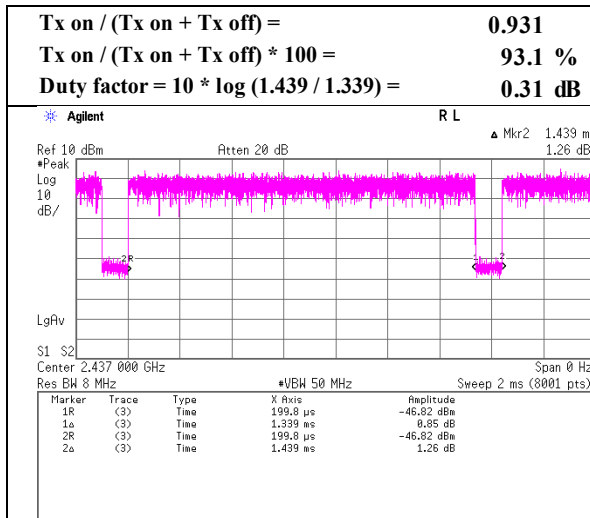
11b 1 Mbps



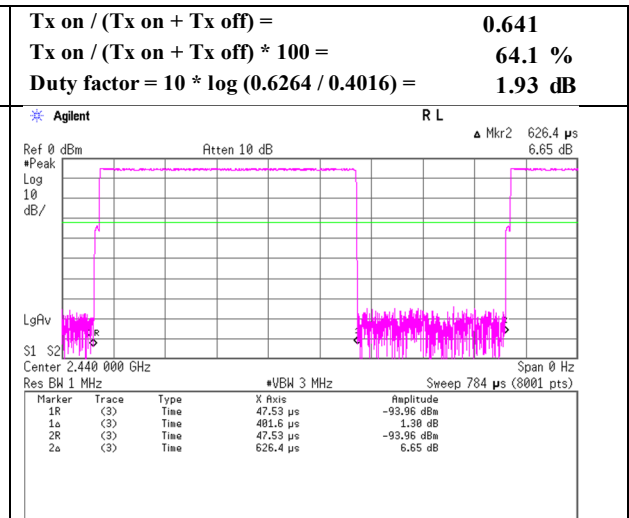
11g 6 Mbps



11n-20 MCS 0



BT LE

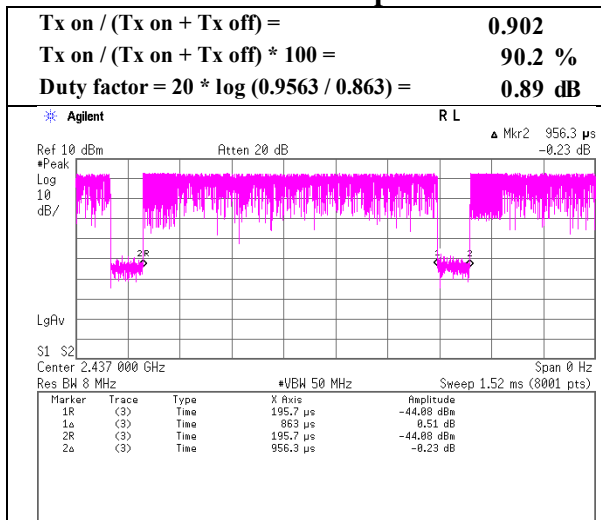


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

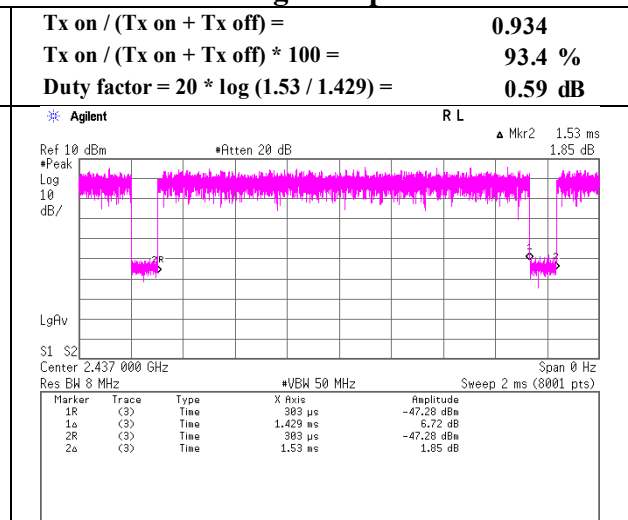
Burst rate confirmation(for Radiated Spurious Emission)

Report No.	13705875S-E-R2	
Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	April 17, 2018	March 19, 2021
Temperature / Humidity	26 deg. C / 31 % RH	26 deg. C / 23 % RH
Engineer	Yosuke Ishikawa	Yusuke Tanikawara
Mode	Tx	

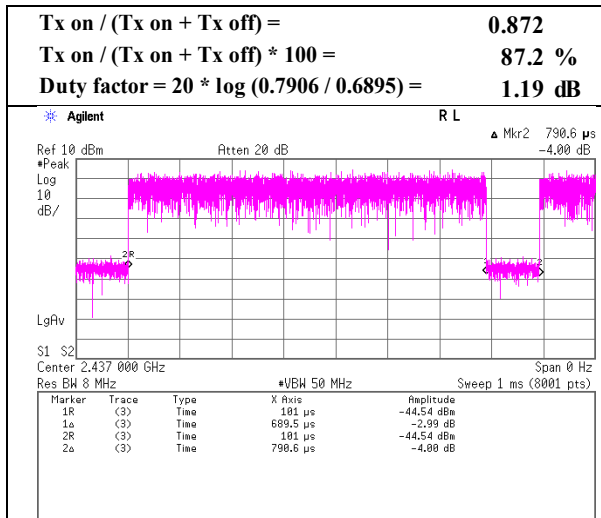
11b 11 Mbps



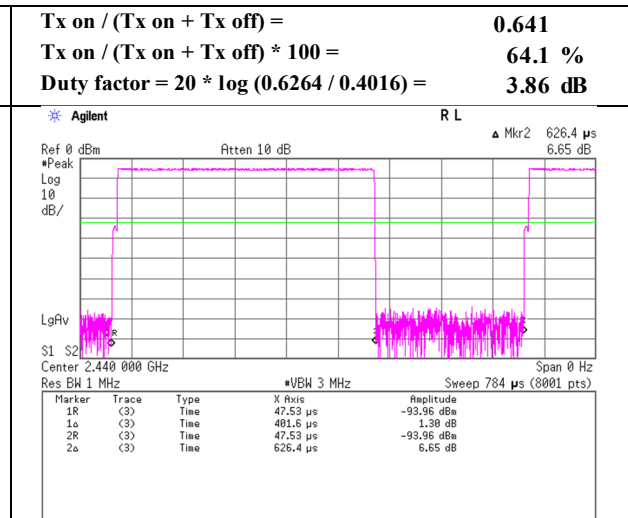
11g 6 Mbps



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.

UL Japan, Inc.

Shonan EMC Lab.

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Radiated Spurious Emission

Report No.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 1, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 32 % RH	22 deg. C / 35 % RH
Engineer	Kenichi Adachi	Takahiro Kawakami
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11b 2412 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	48.54	28.41	14.42	41.62	2.39	52.14	73.9	21.7	201	228	-
Hori.	4824.000	PK	47.74	31.61	6.93	42.89	2.39	45.78	73.9	28.1	150	0	-
Hori.	7236.000	PK	47.38	37.62	8.34	43.42	2.39	52.31	73.9	21.5	150	0	-
Hori.	9648.000	PK	48.24	39.01	9.51	43.12	2.39	56.03	73.9	17.8	150	0	-
Vert.	2390.000	PK	48.58	28.41	14.42	41.62	2.39	52.18	73.9	21.7	288	289	-
Vert.	4824.000	PK	47.68	31.61	6.93	42.89	2.39	45.72	73.9	28.1	150	0	-
Vert.	7236.000	PK	47.27	37.62	8.34	43.42	2.39	52.20	73.9	21.7	150	0	-
Vert.	9648.000	PK	48.18	39.01	9.51	43.12	2.39	55.97	73.9	17.9	150	0	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.42	28.41	14.42	41.62	0.89	2.39	40.91	53.9	12.9	*1)
Hori.	4824.000	AV	37.08	31.61	6.93	42.89	0.89	2.39	36.01	53.9	17.8	-
Hori.	7236.000	AV	37.22	37.62	8.34	43.42	0.89	2.39	43.04	53.9	10.8	-
Hori.	9648.000	AV	37.76	39.01	9.51	43.12	0.89	2.39	46.44	53.9	7.4	-
Vert.	2390.000	AV	36.45	28.41	14.42	41.62	0.89	2.39	40.94	53.9	12.9	*1)
Vert.	4824.000	AV	37.05	31.61	6.93	42.89	0.89	2.39	35.98	53.9	17.9	-
Vert.	7236.000	AV	37.18	37.62	8.34	43.42	0.89	2.39	43.00	53.9	10.9	-
Vert.	9648.000	AV	37.69	39.01	9.51	43.12	0.89	2.39	46.37	53.9	7.5	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Duty factor refer to "Burst rate confirmation" 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	93.39	28.37	14.44	41.63	2.39	96.96	-	-	Carrier
Hori.	2400.000	PK	42.60	28.38	14.43	41.63	2.39	46.17	76.9	30.7	-
Vert.	2412.000	PK	93.08	28.37	14.44	41.63	2.39	96.65	-	-	Carrier
Vert.	2400.000	PK	41.83	28.38	14.43	41.63	2.39	45.40	76.6	31.2	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

UL Japan, Inc.

Shonan EMC Lab.

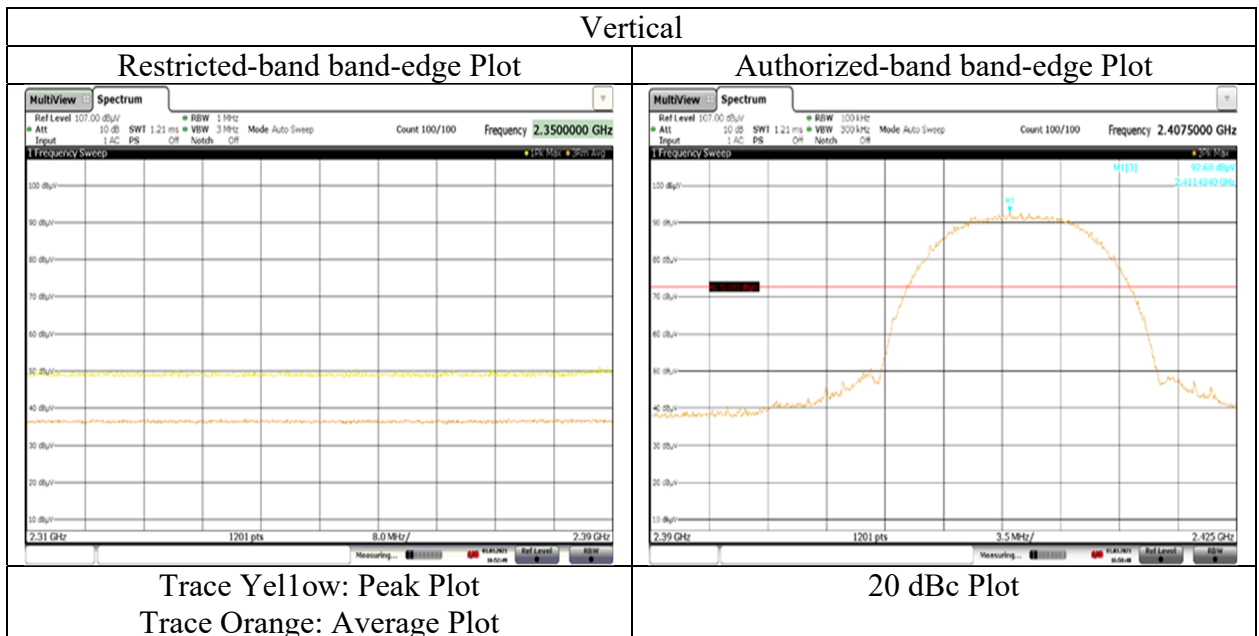
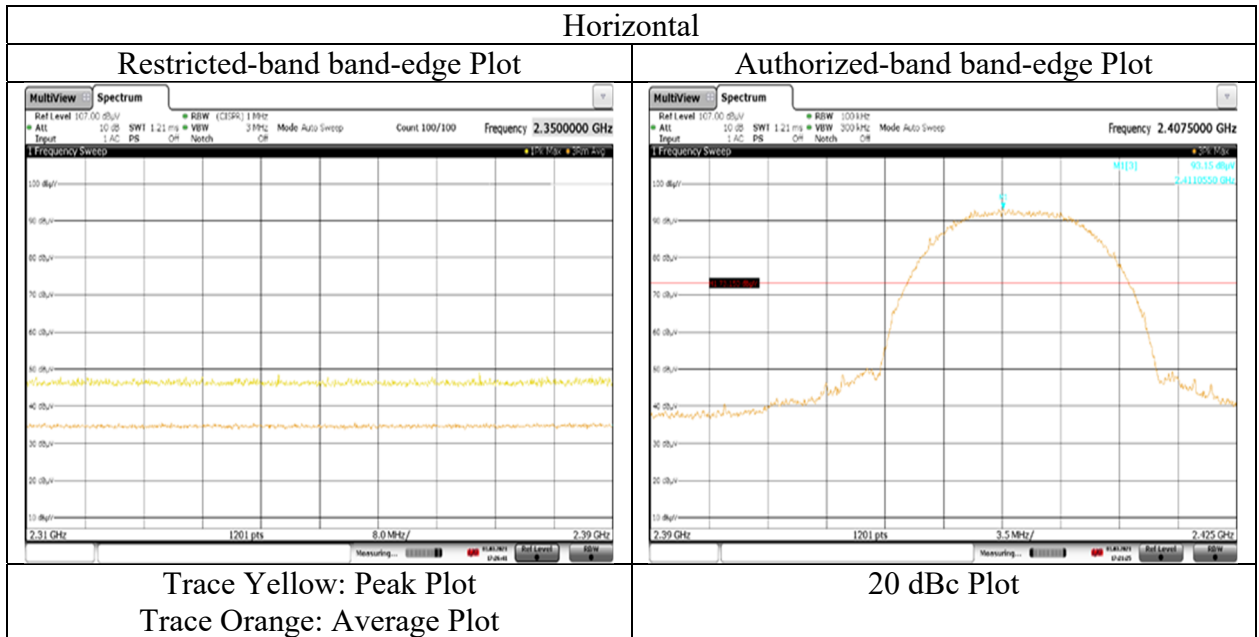
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13705875S-E-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date March 1, 2021
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Kenichi Adachi
(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.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 1, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 32 % RH	22 deg. C / 35 % RH
Engineer	Kenichi Adachi	Takahiro Kawakami
	(1 GHz - 10 GHz)	(10 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	48.32	31.63	6.97	42.89	2.39	46.42	73.9	27.4	150	0	-
Hori.	7311.000	PK	48.02	37.69	8.37	43.51	2.39	52.96	73.9	20.9	150	0	-
Hori.	9748.000	PK	50.22	39.17	9.55	42.99	2.39	58.34	73.9	15.5	150	0	-
Vert.	4874.000	PK	48.23	31.63	6.97	42.89	2.39	46.33	73.9	27.5	150	0	-
Vert.	7311.000	PK	47.94	37.69	8.37	43.51	2.39	52.88	73.9	21.0	150	0	-
Vert.	9748.000	PK	50.18	39.17	9.55	42.99	2.39	58.30	73.9	15.6	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	38.48	31.63	6.97	42.89	0.89	2.39	37.47	53.9	16.4	-
Hori.	7311.000	AV	38.32	37.69	8.37	43.51	0.89	2.39	44.15	53.9	9.7	-
Hori.	9748.000	AV	39.12	39.17	9.55	42.99	0.89	2.39	48.13	53.9	5.7	-
Vert.	4874.000	AV	38.44	31.63	6.97	42.89	0.89	2.39	37.43	53.9	16.4	-
Vert.	7311.000	AV	38.24	37.69	8.37	43.51	0.89	2.39	44.07	53.9	9.8	-
Vert.	9748.000	AV	39.06	39.17	9.55	42.99	0.89	2.39	48.07	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 - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet.

Radiated Spurious Emission

Report No.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 1, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 32 % RH	22 deg. C / 35 % RH
Engineer	Kenichi Adachi	Takahiro Kawakami
	(1 GHz - 10 GHz)	(10 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	47.56	28.28	14.52	41.65	2.39	51.10	73.9	22.8	203	229	-
Hori.	4924.000	PK	48.84	31.68	7.00	42.89	2.39	47.02	73.9	26.8	150	0	-
Hori.	7386.000	PK	49.44	37.81	8.41	43.59	2.39	54.46	73.9	19.4	150	0	-
Hori.	9848.000	PK	48.94	39.16	9.59	42.86	2.39	57.22	73.9	16.6	150	0	-
Vert.	2483.500	PK	47.48	28.28	14.52	41.65	2.39	51.02	73.9	22.8	287	288	-
Vert.	4924.000	PK	48.78	31.68	7.00	42.89	2.39	46.96	73.9	26.9	150	0	-
Vert.	7386.000	PK	49.38	37.81	8.41	43.59	2.39	54.40	73.9	19.5	150	0	-
Vert.	9848.000	PK	48.86	39.16	9.59	42.86	2.39	57.14	73.9	16.7	150	0	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	37.84	28.28	14.52	41.65	0.89	2.39	42.27	53.9	11.6	*1)
Hori.	4924.000	AV	38.82	31.68	7.00	42.89	0.89	2.39	37.89	53.9	16.0	-
Hori.	7386.000	AV	39.04	37.81	8.41	43.59	0.89	2.39	44.95	53.9	8.9	-
Hori.	9848.000	AV	39.64	39.16	9.59	42.86	0.89	2.39	48.81	53.9	5.0	-
Vert.	2483.500	AV	37.78	28.28	14.52	41.65	0.89	2.39	42.21	53.9	11.6	*1)
Vert.	4924.000	AV	38.78	31.68	7.00	42.89	0.89	2.39	37.85	53.9	16.0	-
Vert.	7386.000	AV	38.95	37.81	8.41	43.59	0.89	2.39	44.86	53.9	9.0	-
Vert.	9848.000	AV	39.56	39.16	9.59	42.86	0.89	2.39	48.73	53.9	5.1	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

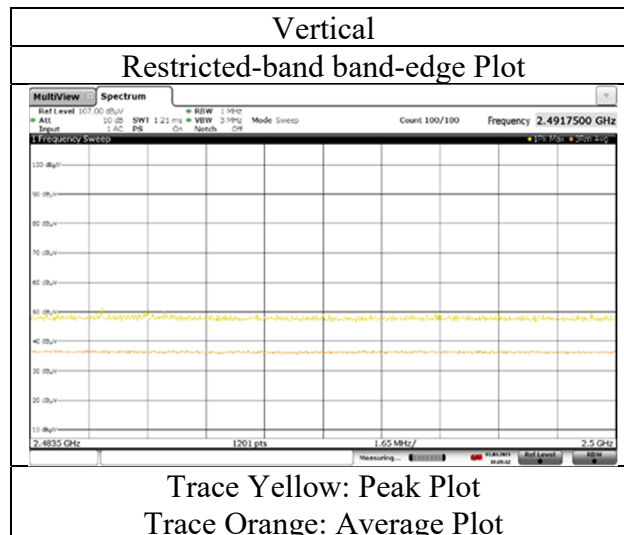
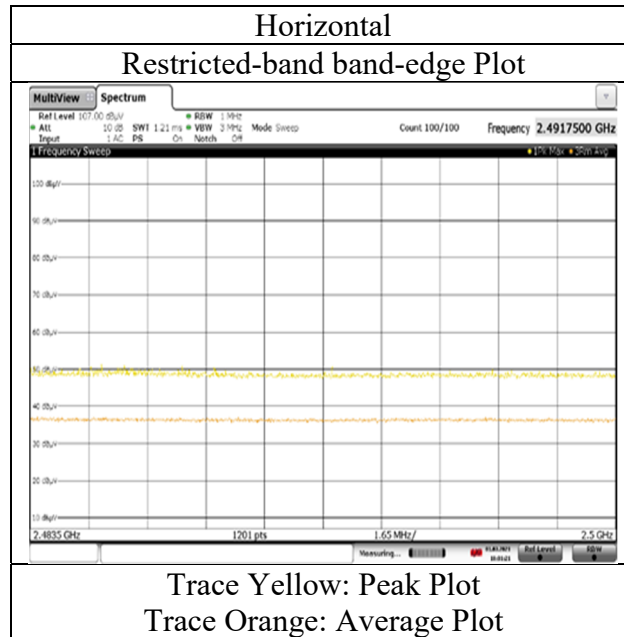
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Burst rate confirmation" sheet.

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13705875S-E-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date March 1, 2021
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Kenichi Adachi
(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.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 2, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 37 % RH	22 deg. C / 35 % RH
Engineer	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 GHz - 26.5 GHz)
Mode	Tx 11g 2412 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	61.60	28.41	14.42	41.62	2.39	65.20	73.9	8.7	231	222	-
Hori.	4824.000	PK	50.13	31.61	6.93	42.89	2.39	48.17	73.9	25.7	150	0	-
Hori.	7236.000	PK	49.73	37.62	8.34	43.42	2.39	54.66	73.9	19.2	150	0	-
Hori.	9648.000	PK	50.35	39.01	9.51	43.12	2.39	58.14	73.9	15.7	150	0	-
Vert.	2390.000	PK	60.31	28.41	14.42	41.62	2.39	63.91	73.9	9.9	246	289	-
Vert.	4824.000	PK	49.30	31.61	6.93	42.89	2.39	47.34	73.9	26.5	150	0	-
Vert.	7236.000	PK	50.36	37.62	8.34	43.42	2.39	55.29	73.9	18.6	150	0	-
Vert.	9648.000	PK	51.34	39.01	9.51	43.12	2.39	59.13	73.9	14.7	150	0	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	40.18	28.41	14.42	41.62	0.59	2.39	44.37	53.9	9.5	*1)
Hori.	4824.000	AV	39.17	31.61	6.93	42.89	0.59	2.39	37.80	53.9	16.1	-
Hori.	7236.000	AV	39.73	37.62	8.34	43.42	0.59	2.39	45.25	53.9	8.6	-
Hori.	9648.000	AV	40.21	39.01	9.51	43.12	0.59	2.39	48.59	53.9	5.3	-
Vert.	2390.000	AV	39.72	28.41	14.42	41.62	0.59	2.39	43.91	53.9	9.9	*1)
Vert.	4824.000	AV	39.55	31.61	6.93	42.89	0.59	2.39	38.18	53.9	15.7	-
Vert.	7236.000	AV	40.26	37.62	8.34	43.42	0.59	2.39	45.78	53.9	8.1	-
Vert.	9648.000	AV	40.33	39.01	9.51	43.12	0.59	2.39	48.71	53.9	5.1	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Duty factor refer to "Burst rate confirmation" 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	89.62	28.37	14.44	41.63	2.39	93.19	-	-	Carrier
Hori.	2400.000	PK	55.75	28.38	14.43	41.63	2.39	59.32	73.1	13.7	-
Hori.	2412.000	PK	90.00	28.37	14.44	41.63	2.39	93.57	-	-	Carrier
Vert.	2400.000	PK	55.30	28.38	14.43	41.63	2.39	58.87	73.5	14.6	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

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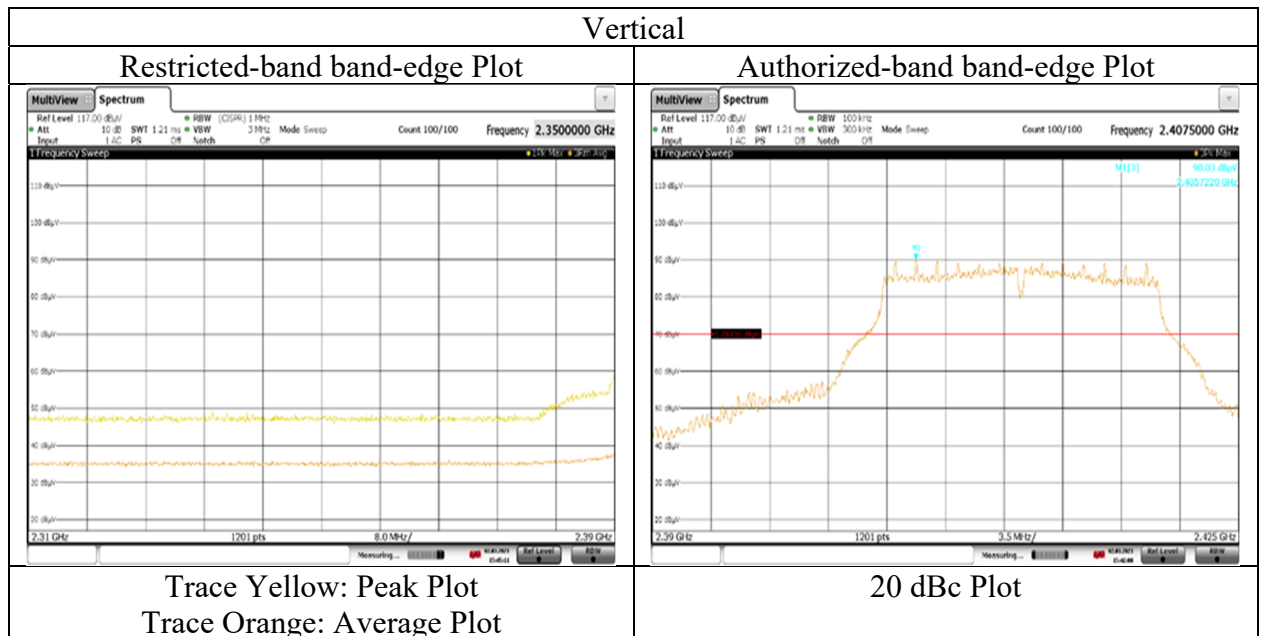
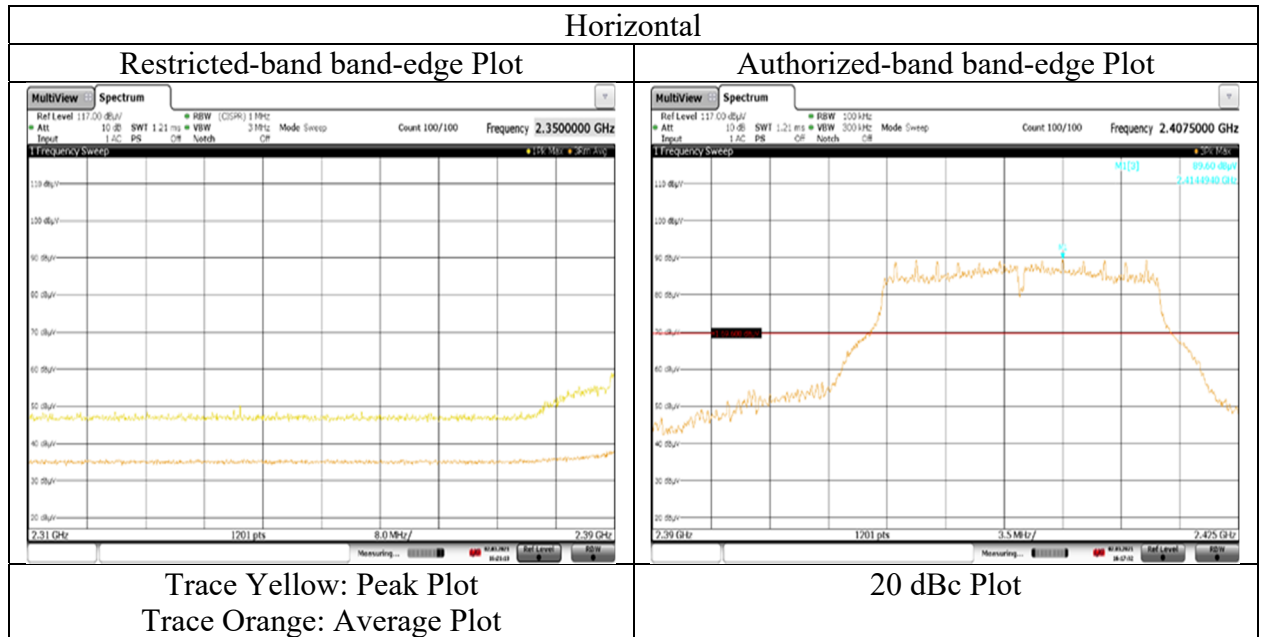
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13705875S-E-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date March 2, 2021
Temperature / Humidity 24 deg. C / 37 % RH
Engineer Yohsuke Matsuzawa
(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.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 2, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 37 % RH	22 deg. C / 35 % RH
Engineer	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz - 10 GHz)	(10 GHz – 26.5 GHz)
Mode	Tx 11g 2437 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	49.83	31.63	6.97	42.89	2.39	47.93	73.9	25.9	150	0	-
Hori.	7311.000	PK	50.13	37.69	8.37	43.51	2.39	55.07	73.9	18.8	150	0	-
Hori.	9748.000	PK	50.72	39.17	9.55	42.99	2.39	58.84	73.9	15.0	150	0	-
Vert.	4874.000	PK	49.13	31.63	6.97	42.89	2.39	47.23	73.9	26.6	150	0	-
Vert.	7311.000	PK	50.91	37.69	8.37	43.51	2.39	55.85	73.9	18.0	150	0	-
Vert.	9748.000	PK	50.18	39.17	9.55	42.99	2.39	58.30	73.9	15.6	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	39.72	31.63	6.97	42.89	0.59	2.39	38.41	53.9	15.4	-
Hori.	7311.000	AV	39.87	37.69	8.37	43.51	0.59	2.39	45.40	53.9	8.4	-
Hori.	9748.000	AV	39.61	39.17	9.55	42.99	0.59	2.39	48.32	53.9	5.5	-
Vert.	4874.000	AV	38.56	31.63	6.97	42.89	0.59	2.39	37.25	53.9	16.6	-
Vert.	7311.000	AV	38.72	37.69	8.37	43.51	0.59	2.39	44.25	53.9	9.6	-
Vert.	9748.000	AV	39.66	39.17	9.55	42.99	0.59	2.39	48.37	53.9	5.5	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet.

Radiated Spurious Emission

Report No.	13705875S-E-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.3	No.2
Date	March 18, 2021	March 2, 2021	March 17, 2021
Temperature / Humidity	20 deg. C / 26 % RH	24 deg. C / 37 % RH	22 deg. C / 35 % RH
Engineer	Takahiro Kawakami (30 MHz - 1 GHz)	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 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.	32.858	QP	22.00	17.58	7.10	31.83	0.00	14.85	40.0	25.1	300	359	-
Hori.	494.421	QP	28.00	17.66	7.71	31.92	0.00	21.45	46.0	24.5	145	229	-
Hori.	600.001	QP	34.40	19.26	8.24	32.03	0.00	29.87	46.0	16.1	126	53	-
Hori.	2483.500	PK	53.35	28.28	14.52	41.65	2.39	56.89	73.9	17.0	157	217	-
Hori.	4924.000	PK	49.70	31.68	7.00	42.89	2.39	47.88	73.9	26.0	150	0	-
Hori.	7386.000	PK	50.63	37.81	8.41	43.59	2.39	55.65	73.9	18.2	150	0	-
Hori.	9848.000	PK	51.17	39.16	9.59	42.86	2.39	59.45	73.9	14.4	150	0	-
Vert.	48.205	QP	29.50	11.83	7.44	31.81	0.00	16.96	40.0	23.0	100	190	-
Vert.	70.603	QP	40.10	6.51	7.59	31.81	0.00	22.39	40.0	17.6	100	246	-
Vert.	73.285	QP	41.00	6.31	7.84	31.81	0.00	23.34	40.0	16.6	100	233	-
Vert.	86.267	QP	39.10	7.47	8.41	31.80	0.00	23.18	40.0	16.8	100	209	-
Vert.	494.754	QP	28.40	17.67	7.71	31.92	0.00	21.86	46.0	24.1	100	144	-
Vert.	574.143	QP	31.30	18.50	8.12	32.03	0.00	25.89	46.0	20.1	100	239	-
Vert.	600.005	QP	34.60	19.26	8.24	32.03	0.00	30.07	46.0	15.9	100	294	-
Vert.	2483.500	PK	52.67	28.28	14.52	41.65	2.39	56.21	73.9	17.6	181	341	-
Vert.	4924.000	PK	50.28	31.68	7.00	42.89	2.39	48.46	73.9	25.4	150	0	-
Vert.	7386.000	PK	50.37	37.81	8.41	43.59	2.39	55.39	73.9	18.5	150	0	-
Vert.	9848.000	PK	51.20	39.16	9.59	42.86	2.39	59.48	73.9	14.4	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.41	28.28	14.52	41.65	0.59	2.39	42.54	53.9	11.3	*1)
Hori.	4924.000	AV	39.36	31.68	7.00	42.89	0.59	2.39	38.13	53.9	15.7	-
Hori.	7386.000	AV	39.57	37.81	8.41	43.59	0.59	2.39	45.18	53.9	8.7	-
Hori.	9848.000	AV	39.55	39.16	9.59	42.86	0.59	2.39	48.42	53.9	5.4	-
Vert.	2483.500	AV	38.81	28.28	14.52	41.65	0.59	2.39	42.94	53.9	10.9	*1)
Vert.	4924.000	AV	39.22	31.68	7.00	42.89	0.59	2.39	37.99	53.9	15.9	-
Vert.	7386.000	AV	39.69	37.81	8.41	43.59	0.59	2.39	45.30	53.9	8.6	-
Vert.	9848.000	AV	39.52	39.16	9.59	42.86	0.59	2.39	48.39	53.9	5.5	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet.

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

UL Japan, Inc.

Shonan EMC Lab.

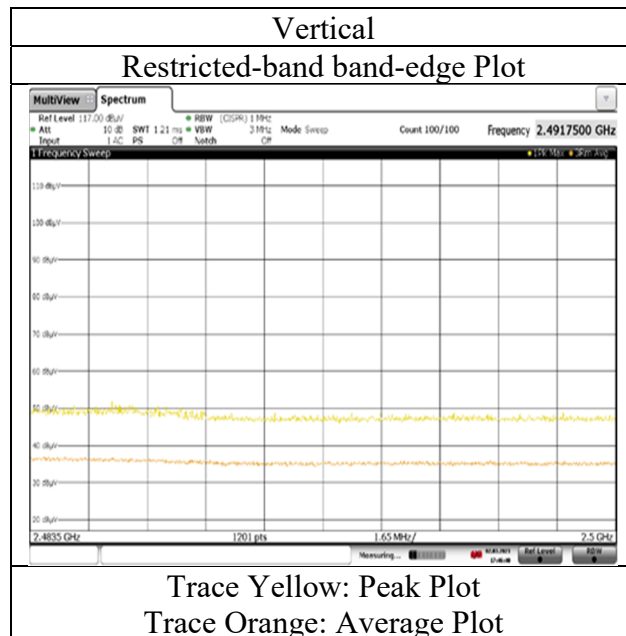
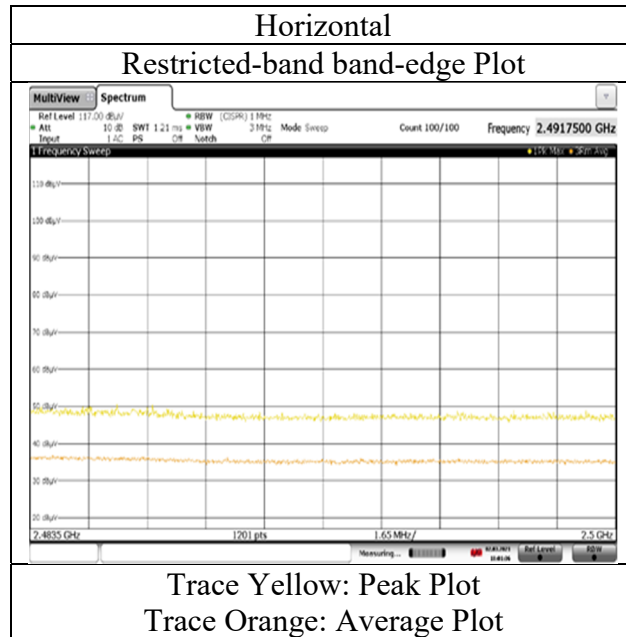
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13705875S-E-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date March 2, 2021
Temperature / Humidity 24 deg. C / 37 % RH
Engineer Yohsuke Matsuzawa
(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.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 2, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 37 % RH	22 deg. C / 35 % RH
Engineer	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 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	56.51	28.41	14.42	41.62	2.39	60.11	73.9	13.7	217	222	-
Hori.	4824.000	PK	48.80	31.61	6.93	42.89	2.39	46.84	73.9	27.0	150	0	-
Hori.	7236.000	PK	49.45	37.62	8.34	43.42	2.39	54.38	73.9	19.5	150	0	-
Hori.	9648.000	PK	50.27	39.01	9.51	43.12	2.39	58.06	73.9	15.8	150	0	-
Vert.	2390.000	PK	55.75	28.41	14.42	41.62	2.39	59.35	73.9	14.5	253	293	-
Vert.	4824.000	PK	48.86	31.61	6.93	42.89	2.39	46.90	73.9	27.0	150	0	-
Vert.	7236.000	PK	48.53	37.62	8.34	43.42	2.39	53.46	73.9	20.4	150	0	-
Vert.	9648.000	PK	48.92	39.01	9.51	43.12	2.39	56.71	73.9	17.1	150	0	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	39.23	28.41	14.42	41.62	1.19	2.39	44.02	53.9	9.8	*1)
Hori.	4824.000	AV	37.53	31.61	6.93	42.89	1.19	2.39	36.76	53.9	17.1	-
Hori.	7236.000	AV	38.80	37.62	8.34	43.42	1.19	2.39	44.92	53.9	8.9	-
Hori.	9648.000	AV	38.70	39.01	9.51	43.12	1.19	2.39	47.68	53.9	6.2	-
Vert.	2390.000	AV	41.57	28.41	14.42	41.62	1.19	2.39	46.36	53.9	7.5	*1)
Vert.	4824.000	AV	38.73	31.61	6.93	42.89	1.19	2.39	37.96	53.9	15.9	-
Vert.	7236.000	AV	38.22	37.62	8.34	43.42	1.19	2.39	44.34	53.9	9.5	-
Vert.	9648.000	AV	39.53	39.01	9.51	43.12	1.19	2.39	48.51	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 - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Duty factor refer to "Burst rate confirmation" 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	90.10	28.37	14.44	41.63	2.39	93.67	-	-	Carrier
Hori.	2400.000	PK	53.77	28.38	14.43	41.63	2.39	57.34	73.6	16.2	-
Hori.	2412.000	PK	89.05	28.37	14.44	41.63	2.39	92.62	-	-	Carrier
Vert.	2400.000	PK	53.04	28.38	14.43	41.63	2.39	56.61	72.6	15.9	-

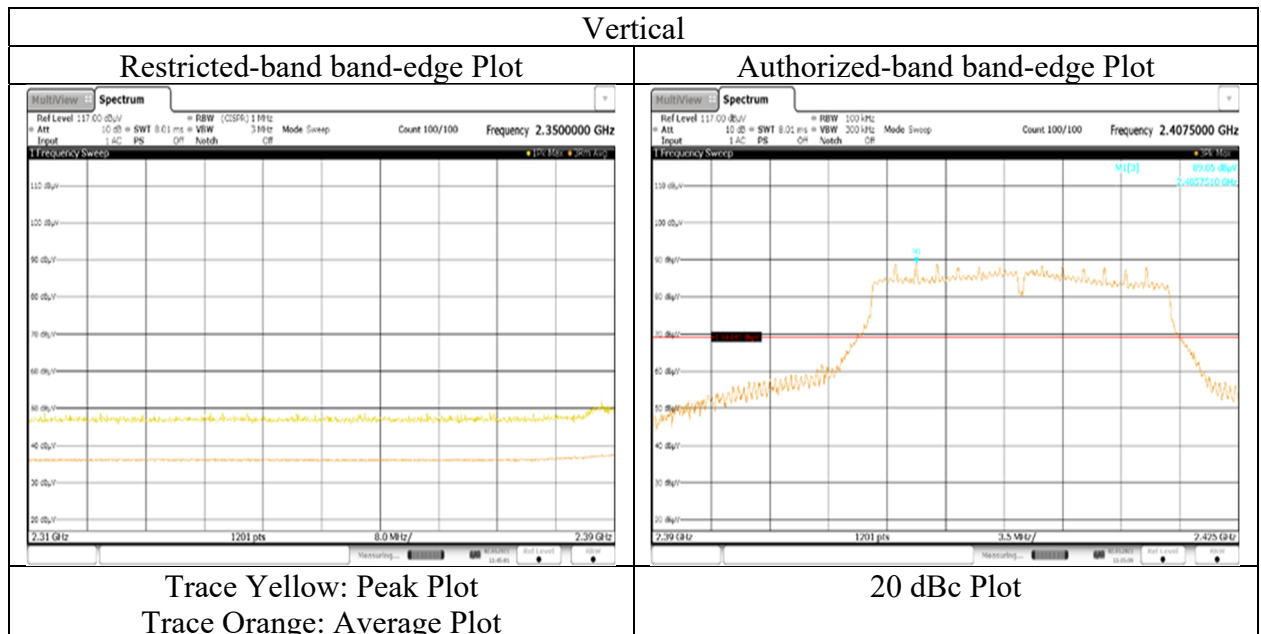
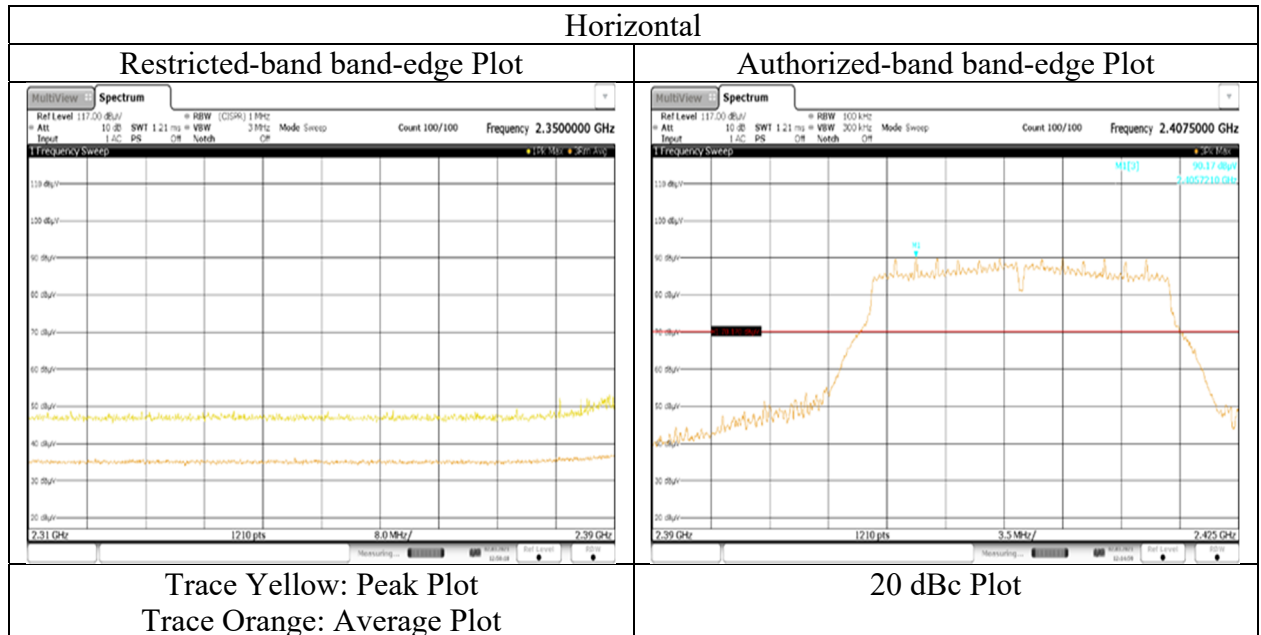
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13705875S-E-R2
 Test place Shonan EMC Lab.
 Semi Anechoic Chamber No.3
 Date March 2, 2021
 Temperature / Humidity 24 deg. C / 37 % RH
 Engineer Yohsuke Matsuzawa
 (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.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 2, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 37 % RH	22 deg. C / 35 % RH
Engineer	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 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	50.75	31.63	6.97	42.89	2.39	48.85	73.9	25.0	150	0	-
Hori.	7311.000	PK	50.16	37.69	8.37	43.51	2.39	55.10	73.9	18.8	150	0	-
Hori.	9748.000	PK	50.58	39.17	9.55	42.99	2.39	58.70	73.9	15.2	150	0	-
Vert.	4874.000	PK	48.95	31.63	6.97	42.89	2.39	47.05	73.9	26.8	150	0	-
Vert.	7311.000	PK	50.20	37.69	8.37	43.51	2.39	55.14	73.9	18.7	150	0	-
Vert.	9748.000	PK	50.33	39.17	9.55	42.99	2.39	58.45	73.9	15.4	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	38.18	31.63	6.97	42.89	1.19	2.39	37.47	53.9	16.4	-
Hori.	7311.000	AV	39.23	37.69	8.37	43.51	1.19	2.39	45.36	53.9	8.5	-
Hori.	9748.000	AV	39.73	39.17	9.55	42.99	1.19	2.39	49.04	53.9	4.8	-
Vert.	4874.000	AV	38.34	31.63	6.97	42.89	1.19	2.39	37.63	53.9	16.2	-
Vert.	7311.000	AV	38.31	37.69	8.37	43.51	1.19	2.39	44.44	53.9	9.4	-
Vert.	9748.000	AV	39.57	39.17	9.55	42.99	1.19	2.39	48.88	53.9	5.0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet.

Radiated Spurious Emission

Report No.	13705875S-E-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	March 2, 2021	March 17, 2021
Temperature / Humidity	24 deg. C / 37 % RH	22 deg. C / 35 % RH
Engineer	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 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	51.55	28.28	14.52	41.65	2.39	55.09	73.9	18.8	145	217	-
Hori.	4924.000	PK	50.16	31.68	7.00	42.89	2.39	48.34	73.9	25.5	150	0	-
Hori.	7386.000	PK	50.10	37.81	8.41	43.59	2.39	55.12	73.9	18.7	150	0	-
Hori.	9848.000	PK	50.35	39.16	9.59	42.86	2.39	58.63	73.9	15.2	150	0	-
Vert.	2483.500	PK	51.72	28.28	14.52	41.65	2.39	55.26	73.9	18.6	237	340	-
Vert.	4924.000	PK	49.38	31.68	7.00	42.89	2.39	47.56	73.9	26.3	150	0	-
Vert.	7386.000	PK	50.84	37.81	8.41	43.59	2.39	55.86	73.9	18.0	150	0	-
Vert.	9848.000	PK	51.85	39.16	9.59	42.86	2.39	60.13	73.9	13.7	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	37.32	28.28	14.52	41.65	1.19	2.39	42.05	53.9	11.8	*1)
Hori.	4924.000	AV	38.56	31.68	7.00	42.89	1.19	2.39	37.93	53.9	15.9	-
Hori.	7386.000	AV	38.68	37.81	8.41	43.59	1.19	2.39	44.89	53.9	9.0	-
Hori.	9848.000	AV	39.37	39.16	9.59	42.86	1.19	2.39	48.84	53.9	5.0	-
Vert.	2483.500	AV	37.96	28.28	14.52	41.65	1.19	2.39	42.69	53.9	11.2	*1)
Vert.	4924.000	AV	38.86	31.68	7.00	42.89	1.19	2.39	38.23	53.9	15.6	-
Vert.	7386.000	AV	38.73	37.81	8.41	43.59	1.19	2.39	44.94	53.9	8.9	-
Vert.	9848.000	AV	39.71	39.16	9.59	42.86	1.19	2.39	49.18	53.9	4.7	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet.

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

UL Japan, Inc.

Shonan EMC Lab.

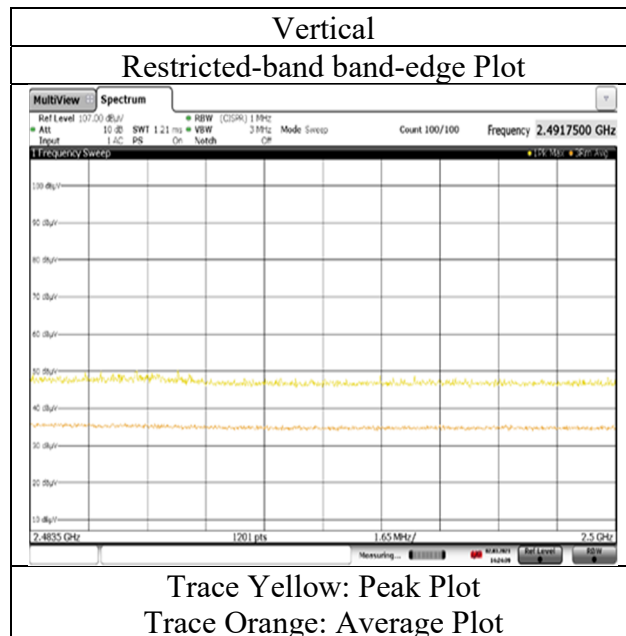
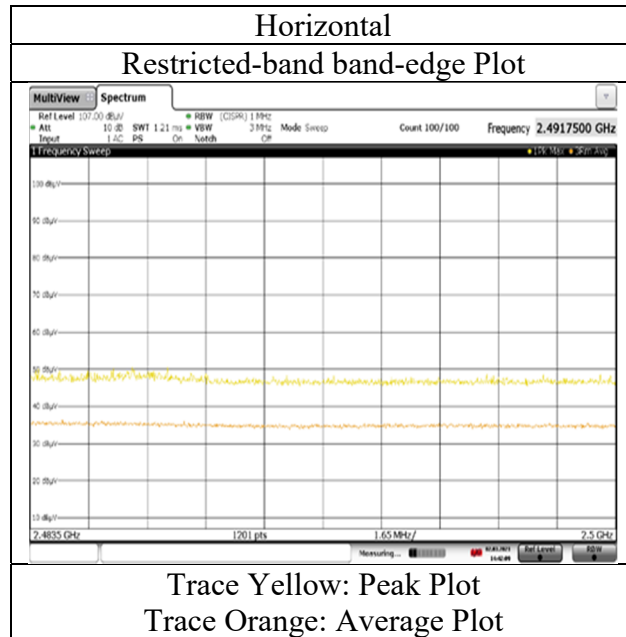
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13705875S-E-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3
Date March 2, 2021
Temperature / Humidity 24 deg. C / 37 % RH
Engineer Yohsuke Matsuzawa
(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

Report No.	13705875S-E-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	March 17, 2021	March 17, 2021	March 17, 2021
Temperature / Humidity	22 deg. C / 35 % RH	23 deg. C / 38 % RH	22 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yohsuke Matsuzawa	Takahiro Kawakami
	(30 MHz - 1 GHz)	(1 GHz - 10 GHz)	(10 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.	193.151	QP	21.60	16.41	8.79	31.79	0.00	15.01	43.5	28.4	400	359	-
Hori.	596.645	QP	26.00	19.14	8.09	31.60	0.00	21.63	46.0	24.3	159	195	-
Hori.	933.894	QP	24.40	21.90	9.61	30.60	0.00	25.31	46.0	20.6	100	99	-
Hori.	2390.000	PK	43.57	28.56	14.19	38.68	2.39	50.03	73.9	23.8	180	228	-
Hori.	4804.000	PK	44.75	31.62	6.75	38.54	2.39	46.97	73.9	26.9	150	0	-
Hori.	7206.000	PK	45.52	37.62	8.28	39.13	2.39	54.68	73.9	19.2	150	0	-
Vert.	47.836	QP	27.00	11.99	7.21	31.90	0.00	14.30	40.0	25.7	100	187	-
Vert.	72.188	QP	38.20	6.38	7.50	31.89	0.00	20.19	40.0	19.8	100	136	-
Vert.	81.004	QP	39.90	6.58	8.15	31.88	0.00	22.75	40.0	17.2	100	171	-
Vert.	407.524	QP	34.10	15.80	7.07	31.64	0.00	25.33	46.0	20.6	115	94	-
Vert.	490.225	QP	29.90	17.55	7.54	31.61	0.00	23.38	46.0	22.6	100	71	-
Vert.	605.802	QP	30.00	19.32	8.14	31.60	0.00	25.86	46.0	20.1	100	33	-
Vert.	2390.000	PK	44.36	28.56	14.19	38.68	2.39	50.82	73.9	23.0	162	306	-
Vert.	4804.000	PK	44.83	31.62	6.75	38.54	2.39	47.05	73.9	26.8	150	0	-
Vert.	7206.000	PK	45.23	37.62	8.28	39.13	2.39	54.39	73.9	19.5	150	0	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	33.87	28.56	14.19	38.68	3.86	2.39	44.19	53.9	9.7	*1)
Hori.	4804.000	AV	33.68	31.62	6.75	38.54	3.86	2.39	39.76	53.9	14.1	-
Hori.	7206.000	AV	34.87	37.62	8.28	39.13	3.86	2.39	47.89	53.9	6.0	-
Vert.	2390.000	AV	34.32	28.56	14.19	38.68	3.86	2.39	44.64	53.9	9.2	*1)
Vert.	4804.000	AV	33.77	31.62	6.75	38.54	3.86	2.39	39.85	53.9	14.0	-
Vert.	7206.000	AV	34.61	37.62	8.28	39.13	3.86	2.39	47.63	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 - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Duty factor refer to "Burst rate confirmation" 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	94.57	28.54	14.21	38.67	2.39	101.04	-	-	Carrier
Hori.	2400.000	PK	39.26	28.54	14.20	38.67	2.39	45.72	81.0	35.2	-
Vert.	2402.000	PK	93.75	28.54	14.21	38.67	2.39	100.22	-	-	Carrier
Vert.	2400.000	PK	37.57	28.54	14.20	38.67	2.39	44.03	80.2	36.1	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

UL Japan, Inc.

Shonan EMC Lab.

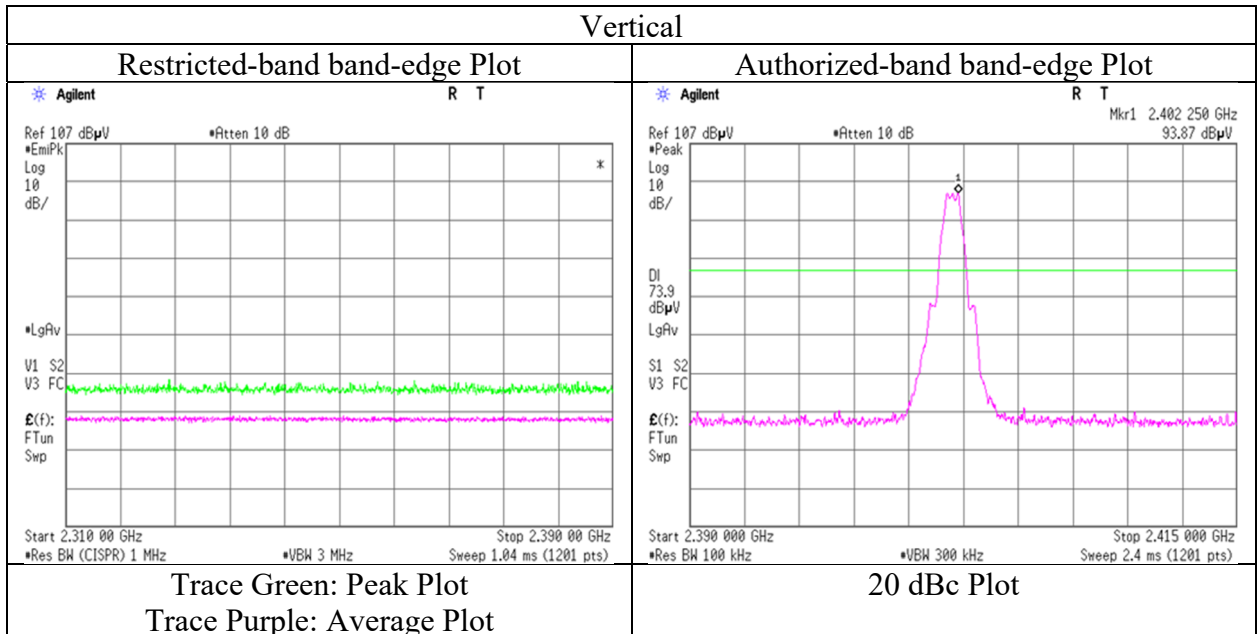
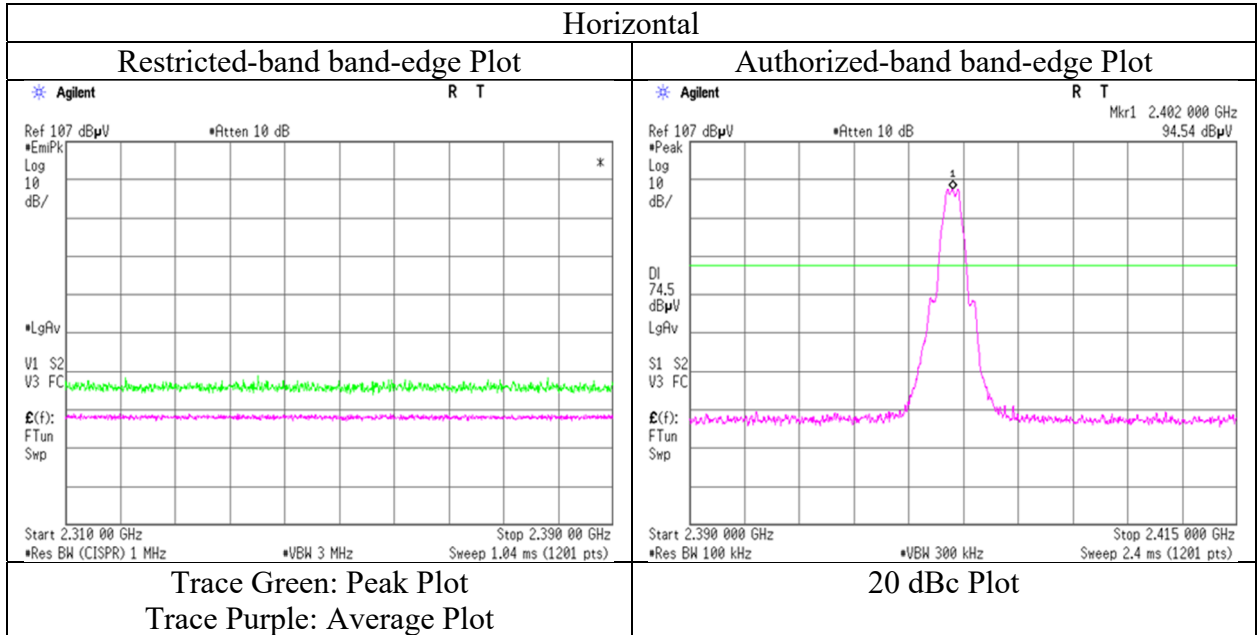
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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

Report No. 13705875S-E-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date March 17, 2021
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yohsuke Matsuzawa
(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.	13705875S-E-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.2	No.2
Date	March 18, 2021	March 17, 2021	March 17, 2021
Temperature / Humidity	20 deg. C / 26 % RH	23 deg. C / 38 % RH	22 deg. C / 35 % RH
Engineer	Takahiro Kawakami	Yohsuke Matsuzawa	Takahiro Kawakami
	(30 MHz - 1 GHz)	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx BT LE 2440 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	190.055	QP	22.00	16.43	8.97	31.77	0.00	15.63	43.5	27.8	173	338	-
Hori.	581.696	QP	29.70	18.73	8.15	32.03	0.00	24.55	46.0	21.4	100	73	-
Hori.	4880.000	PK	43.60	31.58	6.80	38.54	2.39	45.83	73.9	28.0	150	0	-
Hori.	7320.000	PK	44.83	37.73	8.36	39.28	2.39	54.03	73.9	19.8	150	0	-
Vert.	48.137	QP	28.90	11.85	7.44	31.81	0.00	16.38	40.0	23.6	100	155	-
Vert.	71.657	QP	38.80	6.41	7.68	31.81	0.00	21.08	40.0	18.9	100	234	-
Vert.	85.150	QP	37.80	7.22	8.43	31.80	0.00	21.65	40.0	18.3	100	207	-
Vert.	406.148	QP	31.70	15.82	7.23	31.84	0.00	22.91	46.0	23.0	128	283	-
Vert.	432.003	QP	34.40	16.08	7.37	31.87	0.00	25.98	46.0	20.0	123	284	-
Vert.	494.694	QP	31.20	17.67	7.71	31.92	0.00	24.66	46.0	21.3	100	237	-
Vert.	573.445	QP	28.60	18.48	8.12	32.03	0.00	23.17	46.0	22.8	100	206	-
Vert.	602.783	QP	32.00	19.33	8.25	32.03	0.00	27.55	46.0	18.4	100	236	-
Vert.	4880.000	PK	43.73	31.58	6.80	38.54	2.39	45.96	73.9	27.9	150	0	-
Vert.	7320.000	PK	44.31	37.73	8.36	39.28	2.39	53.51	73.9	20.3	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	33.78	31.58	6.80	38.54	3.86	2.39	39.87	53.9	14.0	-
Hori.	7320.000	AV	34.36	37.73	8.36	39.28	3.86	2.39	47.42	53.9	6.4	-
Vert.	4880.000	AV	33.73	31.58	6.80	38.54	3.86	2.39	39.82	53.9	14.0	-
Vert.	7320.000	AV	34.26	37.73	8.36	39.28	3.86	2.39	47.32	53.9	6.5	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet.

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Radiated Spurious Emission

Report No.	13705875S-E-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.2	No.2
Date	March 18, 2021	March 17, 2021	March 17, 2021
Temperature / Humidity	20 deg. C / 26 % RH	23 deg. C / 38 % RH	22 deg. C / 35 % RH
Engineer	Takahiro Kawakami (30 MHz - 1 GHz)	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 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.	182.503	QP	21.90	16.17	8.95	31.77	0.00	15.25	43.5	28.2	204	160	-
Hori.	579.659	QP	29.70	18.67	8.14	32.03	0.00	24.48	46.0	21.5	100	73	-
Hori.	2483.500	PK	44.27	28.40	14.29	38.62	2.39	50.73	73.9	23.1	228	233	-
Hori.	4960.000	PK	43.78	31.74	6.86	38.54	2.39	46.23	73.9	27.6	150	0	-
Hori.	7440.000	PK	44.22	37.84	8.44	39.43	2.39	53.46	73.9	20.4	150	0	-
Vert.	48.021	QP	28.70	11.89	7.44	31.81	0.00	16.22	40.0	23.7	100	192	-
Vert.	71.598	QP	38.60	6.42	7.67	31.81	0.00	20.88	40.0	19.1	100	205	-
Vert.	85.305	QP	37.80	7.26	8.42	31.80	0.00	21.68	40.0	18.3	109	203	-
Vert.	407.118	QP	31.70	15.83	7.24	31.84	0.00	22.93	46.0	23.0	131	281	-
Vert.	490.598	QP	31.30	17.59	7.69	31.91	0.00	24.67	46.0	21.3	100	238	-
Vert.	600.218	QP	31.90	19.27	8.24	32.03	0.00	27.38	46.0	18.6	100	218	-
Vert.	919.150	QP	20.90	22.11	9.71	31.30	0.00	21.42	46.0	24.5	100	359	-
Vert.	2483.500	PK	44.46	28.40	14.29	38.62	2.39	50.92	73.9	22.9	152	344	-
Vert.	4960.000	PK	44.73	31.74	6.86	38.54	2.39	47.18	73.9	26.7	150	0	-
Vert.	7440.000	PK	44.13	37.84	8.44	39.43	2.39	53.37	73.9	20.5	150	0	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	36.28	28.40	14.29	38.62	3.86	2.39	46.60	53.9	7.3	*1)
Hori.	4960.000	AV	33.63	31.74	6.86	38.54	3.86	2.39	39.94	53.9	13.9	-
Hori.	7440.000	AV	35.58	37.84	8.44	39.43	3.86	2.39	48.68	53.9	5.2	-
Vert.	2483.500	AV	35.96	28.40	14.29	38.62	3.86	2.39	46.28	53.9	7.6	*1)
Vert.	4960.000	AV	34.86	31.74	6.86	38.54	3.86	2.39	41.17	53.9	12.7	-
Vert.	7440.000	AV	35.64	37.84	8.44	39.43	3.86	2.39	48.74	53.9	5.1	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB

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

Duty factor refer to "Burst rate confirmation" sheet.

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

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Shonan EMC Lab.

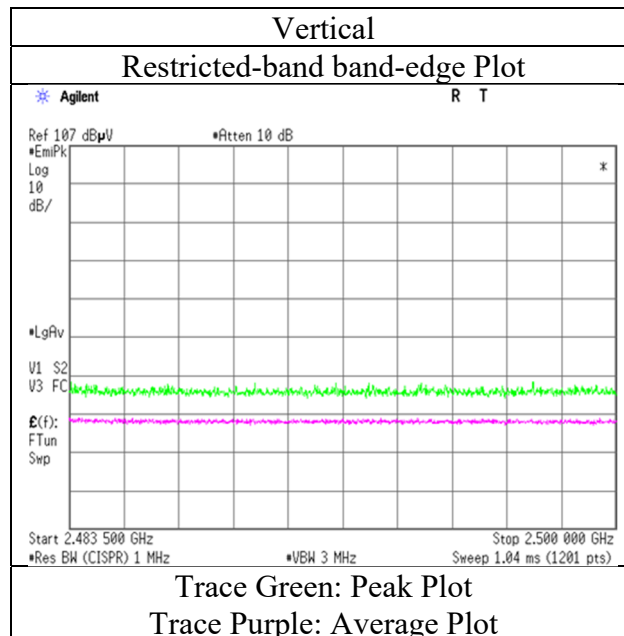
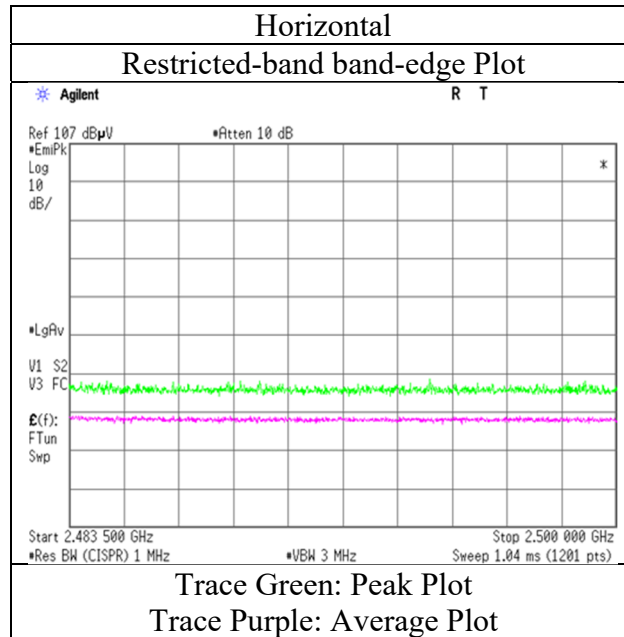
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Radiated Spurious Emission
(Reference Plot for band-edge)

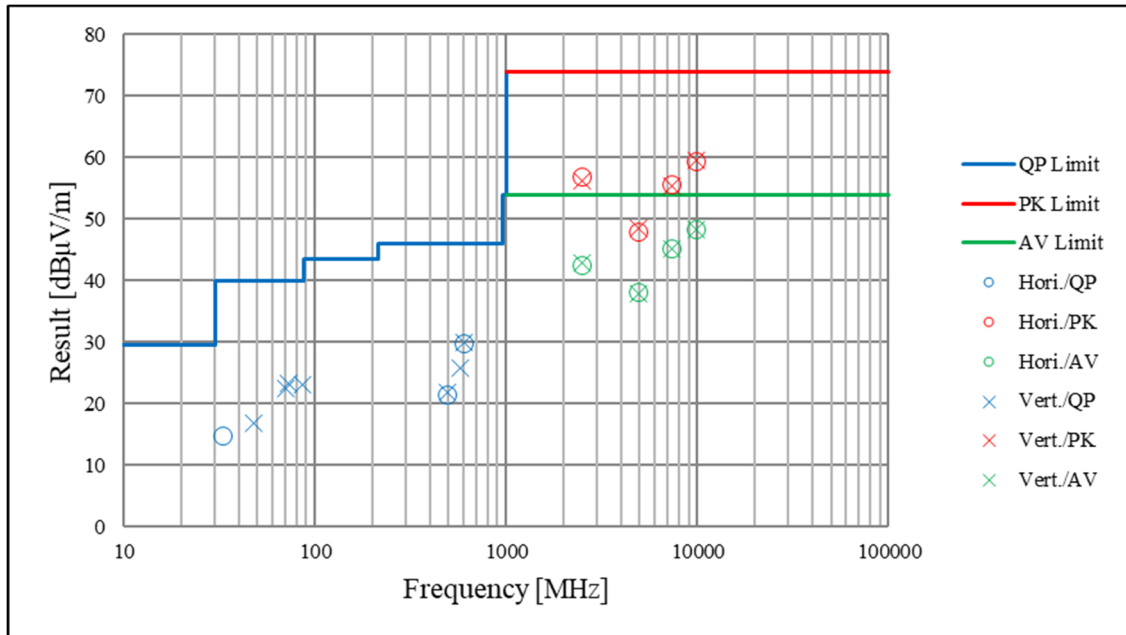
Report No. 13705875S-E-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2
Date March 17, 2021
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yohsuke Matsuzawa
(1 GHz – 2.8 GHz)
Mode Tx BT LE 2480 MHz



* 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)

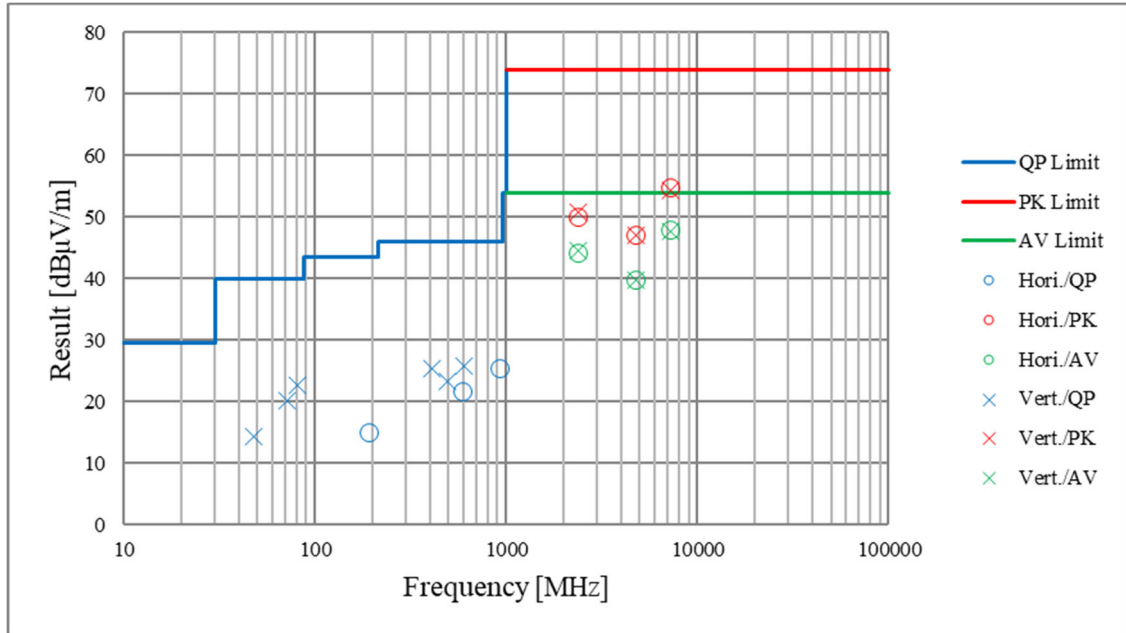
Report No.	13705875S-E-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.3	No.2
Date	March 18, 2021	March 2, 2021	March 17, 2021
Temperature / Humidity	20 deg. C / 26 % RH	24 deg. C / 37 % RH	22 deg. C / 35 % RH
Engineer	Takahiro Kawakami (30 MHz - 1 GHz)	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 GHz - 26.5 GHz)
Mode	Tx 11g 2462 MHz		



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13705875S-E-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.1	No.2	No.2
Date	March 18, 2021	March 17, 2021	March 17, 2021
Temperature / Humidity	22 deg. C / 35 % RH	23 deg. C / 38 % RH	22 deg. C / 35 % RH
Engineer	Takahiro Kawakami (30 MHz - 1 GHz)	Yohsuke Matsuzawa (1 GHz - 10 GHz)	Takahiro Kawakami (10 GHz - 26.5 GHz)
Mode	Tx BT LE 2402 MHz		



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