



RADIO TEST REPORT

Test Report No. 14630442S-B-R1

Customer	Sony Group Corporation
Description of EUT	Wireless Noise Canceling Stereo Headset
Model Number of EUT	YY2963
FCC ID	AK8YY2963
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied (Refer to SECTION 3)
Issue Date	February 17, 2023
Remarks	Bluetooth Low Energy part(s)

Representative Test Engineer

Yohsuke Matsuzawa
Engineer

Approved By

Toyokazu Imamura
Leader



CERTIFICATE 1266.03

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

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 21.0

ANNOUNCEMENT

- This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
- The results in this report apply only to the sample tested. (Laboratory was not involved in sampling.)
- This sample tested is in compliance with the limits of the above regulation.
- The test results in this test report are traceable to the national or international standards.
- This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
- This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
- The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
- The information provided from the customer for this report is identified in Section 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No.: 14630442S-B

This report is a revised version of 14630442S-B. 14630442S-B is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14630442S-B	January 31, 2023	-
1	14630442S-B-R1	February 17, 2023	Page 5 Corrected the test date from December 26 to January 16, 2022 to December 26, 2022 to January 16, 2023. Page 10 Corrected USB Cable and Connector information in the List of Cables Used from “Unshielded” to “Shielded”.

Reference: Abbreviations (Including words undescribed in this report)

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

CONTENTS	PAGE
SECTION 1: Customer Information	5
SECTION 2: Equipment Under Test (EUT).....	5
SECTION 3: Test Specification, Procedures & Results	6
SECTION 4: Operation of EUT during testing.....	9
SECTION 5: Radiated Spurious Emission	11
SECTION 6: Antenna Terminal Conducted Tests.....	13
APPENDIX 1: Test Data	14
99 % Occupied Bandwidth and 6 dB Bandwidth	14
Maximum Peak Output Power/ Average Output Power(Reference data for RF Exposure).....	17
Radiated Spurious Emission	19
Conducted Spurious Emission	41
Power Density	47
APPENDIX 2: Test Instruments.....	49
APPENDIX 3: Photographs of Test Setup	51
Radiated Spurious Emission	51
Pre-check of Worst Case Position.....	52
Antenna Terminal Conducted Tests.....	53

SECTION 1: Customer Information

Company Name	Sony Group Corporation
Address	1-7-1 Konan Minato-ku, Tokyo, 108-0075 Japan
Contact Person	Kazuhiko Nagano

The information provided from the customer is as follows;

- Customer, Description 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 and Test 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

Description	Wireless Noise Canceling Stereo Headset
Model Number	YY2963
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	December 20, 2022
Test Date	January 16, 2023 *Antenna Terminal Conducted tests only
	December 26, 2022 to January 16, 2023

2.2 Product Description

General Specification

Rating	DC 3.85 V (Battery)
Operating temperature	0 deg. C to +40 deg. C

Radio Specification

Bluetooth (BR / EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8 DPSK)
Antenna Gain	-3 dBi

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	GFSK
Antenna Gain	-3 dBi

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
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

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods ISED: RSS-Gen 8.8	FCC: Section 15.207 ISED: RSS-Gen 8.8	N/A	N/A	*1)
6dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(2) ISED: RSS-247 5.2(a)	See data.	Complied a)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ISED: RSS-247 5.4(d)		Complied b)	Conducted
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(e) ISED: RSS-247 5.2(b)		Complied c)	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.1 dB 2483.500 MHz, AV, Hori. 2483.500 MHz, AV, Vert. Mode: Tx BT LE 2 M-PHY 2480 MHz, Left	Complied d), e)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593. * In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred. *1) The test was not applicable since the BLE does not operate during charging. *2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6. a) Refer to APPENDIX 1 (data of 99 % Occupied Bandwidth and 6 dB Bandwidth) b) Refer to APPENDIX 1 (data of Maximum Peak Output Power/ Average Output Power) c) Refer to APPENDIX 1 (data of Power Density) d) Refer to APPENDIX 1 (data of Conducted Spurious Emission) e) Refer to APPENDIX 1 (data of Radiated Spurious Emission)					

FCC Part 15.31 (e)

This EUT provides the 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 of Section 15.203.

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 99 % Occupied Bandwidth and 6 dB Bandwidth)					

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

3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

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

Item	Frequency range	Uncertainty (+/-)
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.1 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.3 dB
	30 MHz-200 MHz	4.8 dB
	200 MHz-1 GHz	6.1 dB
	1 GHz-6 GHz	4.7 dB
	6 GHz-18 GHz	5.3 dB
	18 GHz-40 GHz	5.5 dB
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB
	18 GHz-40 GHz	5.8 dB

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	1.3 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	2.1 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	1.1 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.2 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.1 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.4 dB
Spurious emission (Conducted) below 1 GHz	0.8 dB
Conducted emissions Power Density Measurement 1 GHz-3 GHz	0.9 dB
Conducted emissions Power Density Measurement 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.4 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	0.87 deg.C.
Humidity_SCH-01	3.5 %
Temperature_SCH-02	2.0 deg.C.
Humidity_SCH-02	6.7 %
Voltage	0.97 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

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

Telephone: +81-463-50-6400

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)

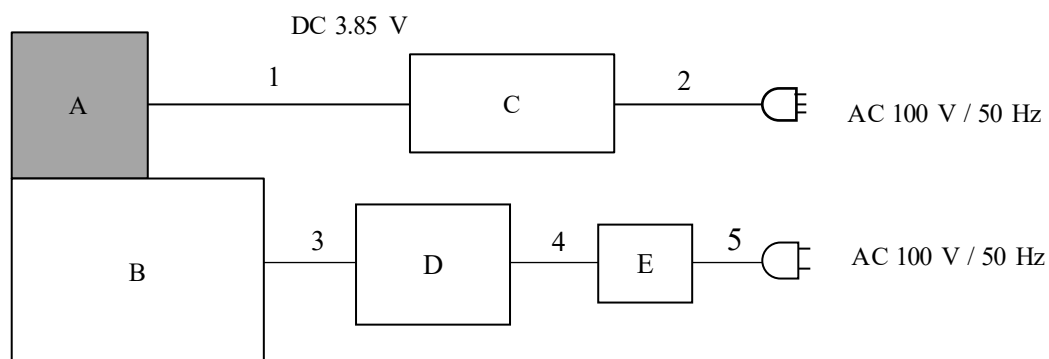
Mode	Remarks*
Bluetooth Low Energy (BLE) 1M-PHY Uncoded PHY (1M-PHY)	Maximum Packet Size, PRBS9
Bluetooth Low Energy (BLE) 2M-PHY Uncoded PHY (2M-PHY)	Maximum Packet Size, PRBS9
*Power of the EUT was set by the software as follows; Power Setting: 46 Software: BT Test Tool Version: 0.04 (Date: 2022.10.31, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The Details of Operating Mode(s)

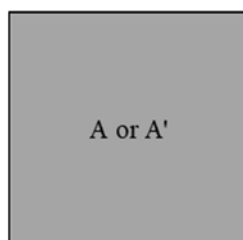
Test Item	Operating Mode	Tested frequency
Radiated Spurious Emission (Below 1 GHz)	Tx BT LE, 2M-PHY *1)	2402 MHz
Radiated Spurious Emission (Above 1 GHz), Maximum Peak Output Power, Power Density, 6dB Bandwidth, 99% Occupied Bandwidth, Conducted Spurious Emission	Tx BT LE, 1M-PHY Tx BT LE, 2M-PHY	2402 MHz 2440 MHz 2480 MHz
*1) Conducted emissions and Spurious emissions for frequencies below 1 GHz were limited to the channel that had the highest power during the antenna terminal test, as preliminary testing indicated that changing the operating frequency had no significant impact on the emissions in those frequency bands.		

4.2 Configuration and Peripherals

[Antenna Terminal Conducted tests]



[Radiated Emission test]



Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Wireless Noise Canceling Stereo Headset	YY2963	1300870 *1)	SONY	EUT (Left)
			1300740 *2)	SONY	EUT (Left)
A'	Wireless Noise Canceling Stereo Headset	YY2963	1300870 *1)	SONY	EUT (Right)
			1300740 *2)	SONY	EUT (Right)
B	Case	YY2963	1300870	SONY	-
C	Power Supply (DC)	PW18-2ATP	19050351	TEXIO	-
D	Laptop Computer	ThinkPad L580	PF-1LTWLZ	LENOVO	-
E	AC Adapter	ADLX45YLC2A	8SSA10E75842L1CZ94J0D3R	LENOVO	-

*1) For the Antenna Terminal Conducted tests

*2) For the Radiated Emission test

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.1	Unshielded	Unshielded	-
2	AC	1.5	Unshielded	Unshielded	-
3	USB	0.2	Shielded	Shielded	-
4	DC	1.8	Unshielded	Unshielded	-
5	AC	0.9	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

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

[For above 1 GHz]

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

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

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

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

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

Test Antennas are used as below;

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

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

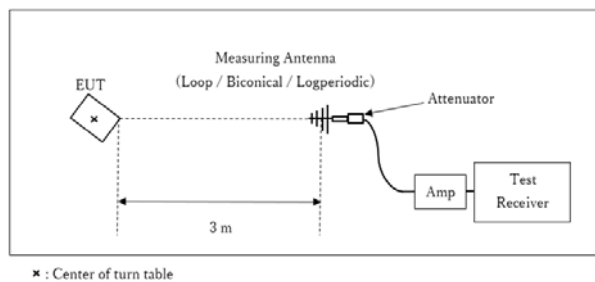
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument Used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	11.12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

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

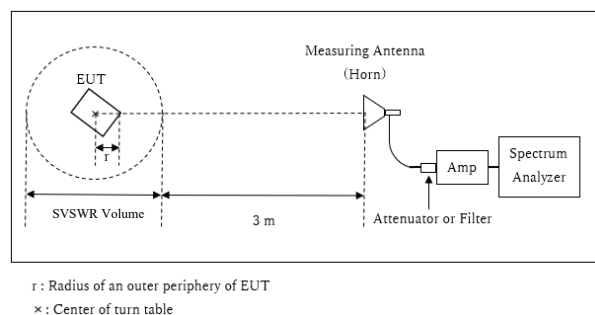
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

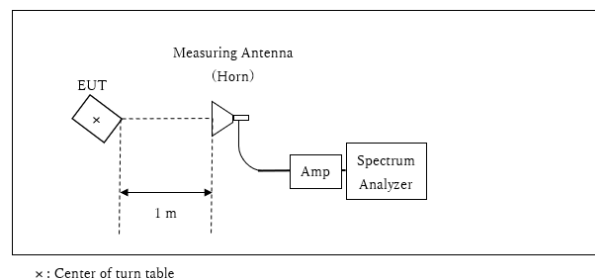
1 GHz to 10 GHz



Distance Factor: $20 \times \log (3.99 \text{ m} / 3.0 \text{ m}) = 2.48 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.99 \text{ m}$

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.01 \text{ m}$

10 GHz to 26.5 GHz



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

- The 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.

		Below 30 MHz	1-2.8 GHz	2.8-10 GHz	10-18 GHz	18-26.5 GHz
EUT (Left)	Horizontal	X	X	X	X	X
	Vertical	X	Z	X	X	X
EUT(Right)	Horizontal	X	X	X	X	X
	Vertical	X	Z	X	X	X

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

Measurement Range : 30 MHz to 26.5 GHz
Test Data : APPENDIX
Test Result : Pass

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.
The antenna terminal conducted test was performed only for the left side as representative.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument Used
6dB Bandwidth	Enough width to display emission skirts	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)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
*1) Peak hold was applied as Worst-case measurement. *2) Reference data *3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013". *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz) *5) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.							

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

Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test Data

99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	December 26, 2022
Temperature / Humidity	22 deg. C / 25 % RH
Engineer	Miku Ikudome
Mode	Tx

BT LE 1 M-PHY

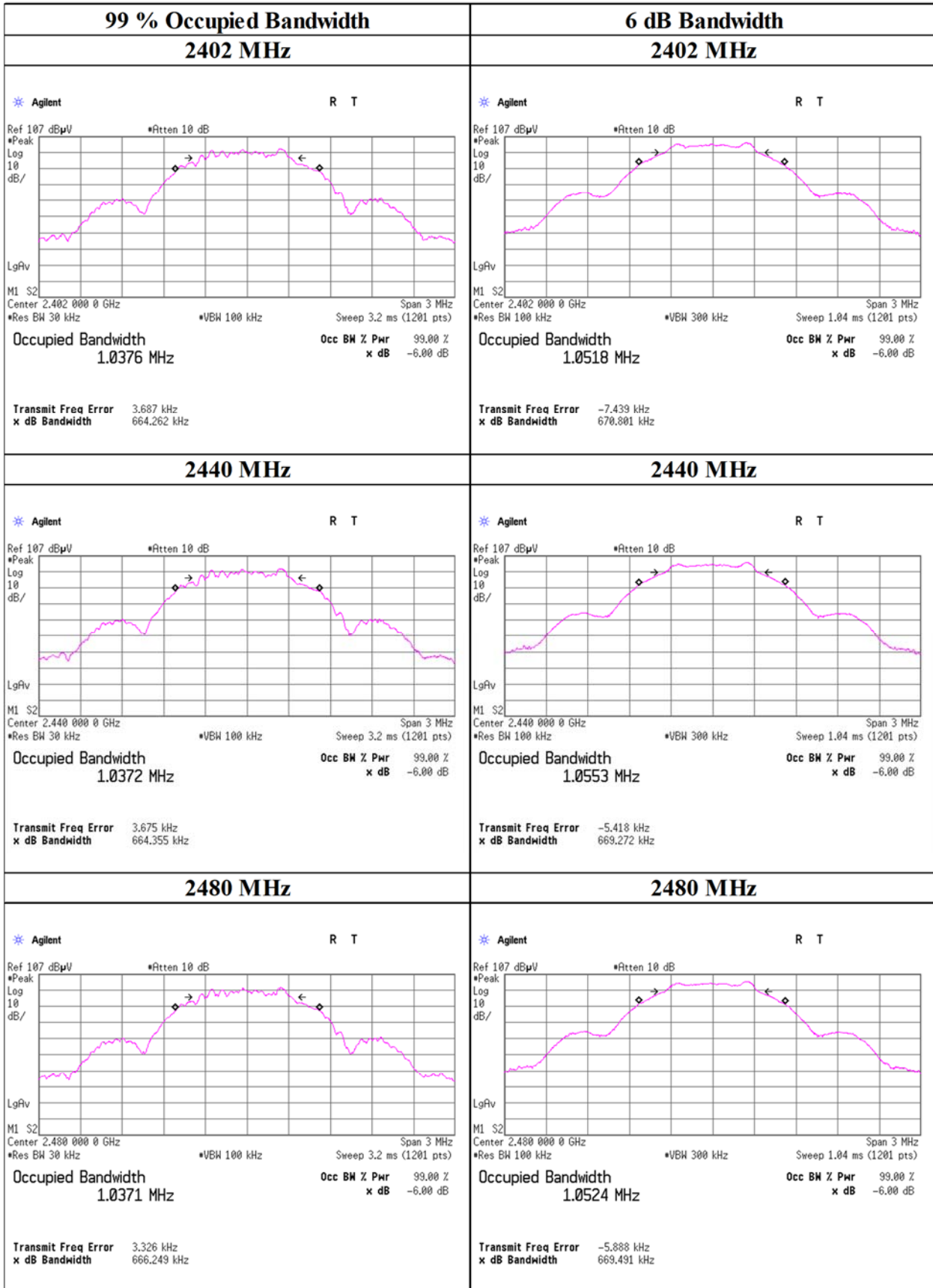
Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2402	1037.6	0.671	> 0.5000
2440	1037.2	0.669	> 0.5000
2480	1037.1	0.669	> 0.5000

BT LE 2 M-PHY

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2402	2074.8	1.247	> 0.5000
2440	2074.4	1.252	> 0.5000
2480	2072.4	1.173	> 0.5000

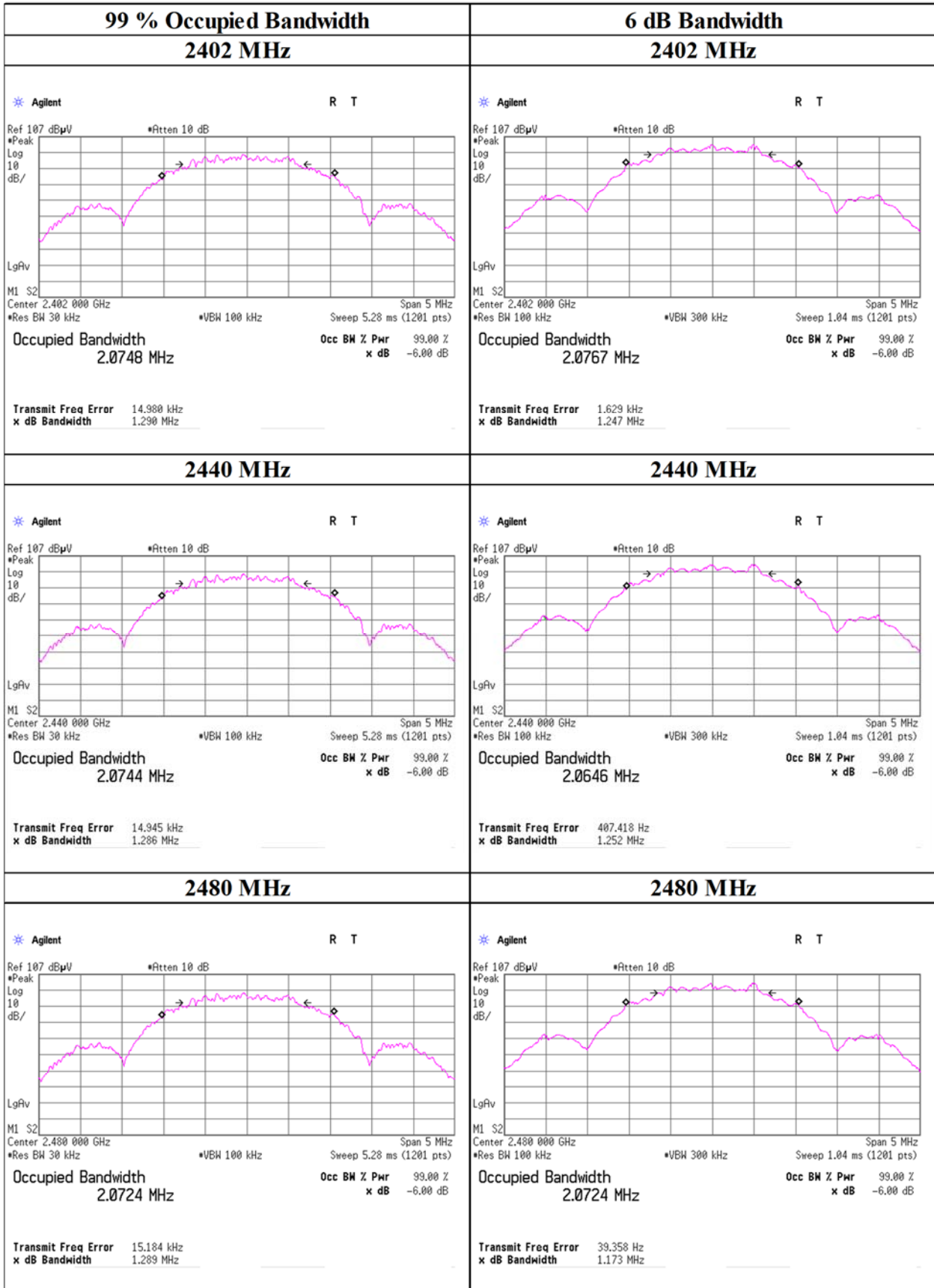
99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE 1 M-PHY



99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE 2 M-PHY



Maximum Peak Output Power/ Average Output Power(Reference data for RF Exposure)

Test place Shonan EMC Lab. No.5 Shielded Room
Date January 16, 2023
Temperature / Humidity 25 deg. C / 49 % RH
Engineer Takahiro Kawakami
Mode Tx

BT LE 1 M-PHY

Maximum peak output power

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-2.78	1.25	9.88	8.35	6.84	30.00	1000	21.65	-3.00	5.35	3.43	36.02	4000	30.67
2440	-2.93	1.26	9.88	8.21	6.62	30.00	1000	21.79	-3.00	5.21	3.32	36.02	4000	30.81
2480	-3.14	1.26	9.89	8.01	6.32	30.00	1000	21.99	-3.00	5.01	3.17	36.02	4000	31.01

BT LE 2 M-PHY

Maximum peak output power

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-2.77	1.25	9.88	8.36	6.85	30.00	1000	21.64	-3.00	5.36	3.44	36.02	4000	30.66
2440	-2.93	1.26	9.88	8.21	6.62	30.00	1000	21.79	-3.00	5.21	3.32	36.02	4000	30.81
2480	-3.15	1.26	9.89	8.00	6.31	30.00	1000	22.00	-3.00	5.00	3.16	36.02	4000	31.02

Sample Calculation:

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

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

BT LE 1 M-PHY

Average power

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
	[MHz]	[dB]	[dB]			[dB]		
2402	-3.70	1.25	9.88	7.43	5.53	0.65	8.08	6.43
2440	-3.85	1.26	9.88	7.29	5.36	0.65	7.94	6.22
2480	-4.07	1.26	9.89	7.08	5.11	0.65	7.73	5.93

BT LE 2 M-PHY

Average power

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
	[MHz]	[dB]	[dB]			[dB]		
2402	-5.46	1.25	9.88	5.67	3.69	2.40	8.07	6.41
2440	-5.63	1.26	9.88	5.51	3.56	2.40	7.91	6.18
2480	-5.84	1.26	9.89	5.31	3.40	2.40	7.71	5.90

Sample Calculation:

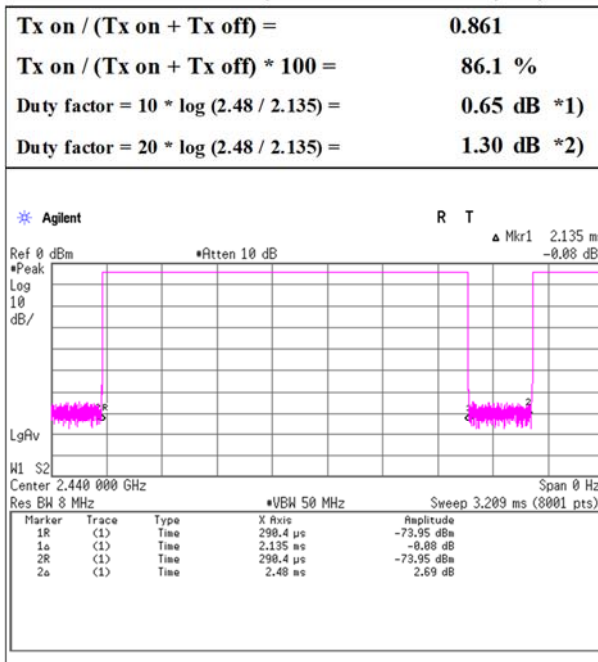
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

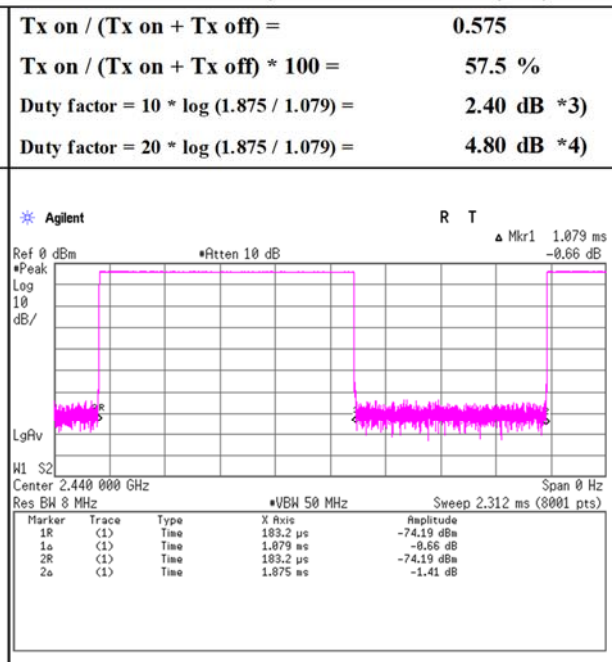
Burst rate confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	December 26, 2022
Temperature / Humidity	22 deg. C / 25 % RH
Engineer	Miku Ikudome
Mode	Tx

BT LE 1 M-PHY (for Average power) *1)
BT LE 1 M-PHY (for Radiated emission) *2)



BT LE 2 M-PHY (for Average power) *3)
BT LE 2 M-PHY (for Radiated emission) *4)



Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 13, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 33 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Takahiro Suzuki	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz, Left		

(* 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	49.07	28.18	14.49	41.63	2.48	52.59	73.9	21.3	163	38	-
Hori.	4804.000	PK	49.63	31.54	6.95	42.87	2.48	47.73	73.9	26.1	150	0	-
Hori.	7206.000	PK	49.52	37.37	8.41	43.39	2.48	54.39	73.9	19.5	150	0	-
Hori.	9608.000	PK	49.16	38.89	9.68	43.21	2.48	57.00	73.9	16.9	150	0	-
Hori.	4804.000	AV	38.97	31.54	6.95	42.87	2.48	37.07	53.9	16.8	150	0	Floor Noise
Hori.	7206.000	AV	39.00	37.37	8.41	43.39	2.48	43.87	53.9	10.0	150	0	Floor Noise
Hori.	9608.000	AV	38.41	38.89	9.68	43.21	2.48	46.25	53.9	7.6	150	0	Floor Noise
Vert.	2390.000	PK	49.36	28.18	14.49	41.63	2.48	52.88	73.9	21.0	253	249	-
Vert.	4804.000	PK	50.07	31.54	6.95	42.87	2.48	48.17	73.9	25.7	150	0	-
Vert.	7206.000	PK	49.51	37.37	8.41	43.39	2.48	54.38	73.9	19.5	150	0	-
Vert.	9608.000	PK	49.66	38.89	9.68	43.21	2.48	57.50	73.9	16.4	150	0	-
Vert.	4804.000	AV	38.90	31.54	6.95	42.87	2.48	37.00	53.9	16.9	150	0	Floor Noise
Vert.	7206.000	AV	39.07	37.37	8.41	43.39	2.48	43.94	53.9	9.9	150	0	Floor Noise
Vert.	9608.000	AV	38.42	38.89	9.68	43.21	2.48	46.26	53.9	7.6	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : 20log(3.99 m / 3.0 m) = 2.48 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	38.03	28.18	14.49	41.63	1.31	2.48	42.86	53.9	11.0	*1)
Vert.	2390.000	AV	38.06	28.18	14.49	41.63	1.31	2.48	42.89	53.9	11.0	*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(3.99 m / 3.0 m) = 2.48 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	88.78	28.17	14.51	41.64	2.48	92.30	-	-	Carrier
Hori.	2400.000	PK	38.22	28.17	14.51	41.64	2.48	41.74	72.3	30.5	-
Vert.	2402.000	PK	86.91	28.17	14.51	41.64	2.48	90.43	-	-	Carrier
Vert.	2400.000	PK	38.10	28.17	14.51	41.64	2.48	41.62	70.4	28.7	-

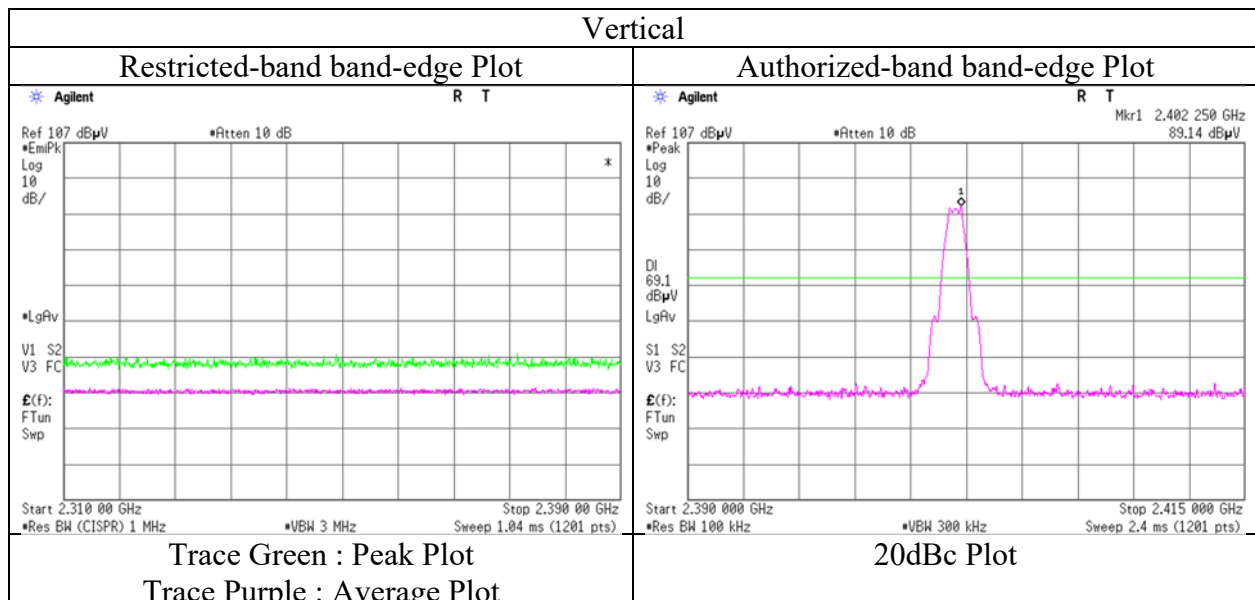
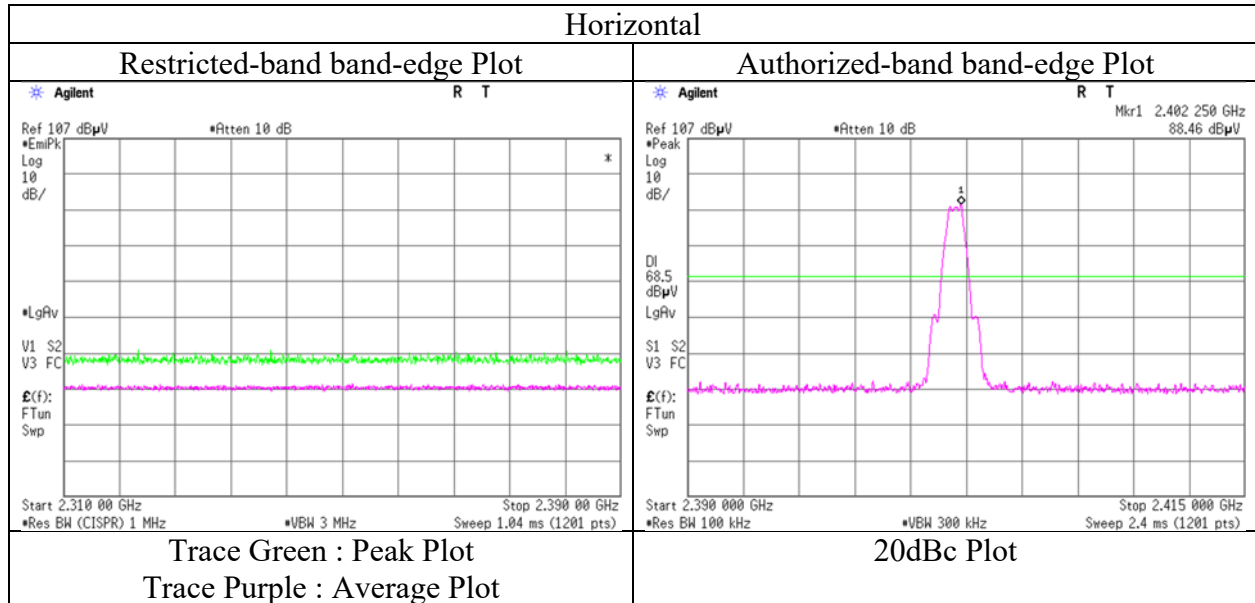
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log(3.99 m / 3.0 m) = 2.48 dB

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 13, 2023
Temperature / Humidity	23 deg.C, 33 %RH
Engineer	Takahiro Suzuki
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz, Left



* 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

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 13, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 33 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Takahiro Suzuki	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2440 MHz, Left		

(* 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.	4880.000	PK	48.88	31.64	6.99	42.83	2.48	47.16	73.9	26.7	150	0	-
Hori.	7320.000	PK	48.22	37.46	8.45	43.52	2.48	53.09	73.9	20.8	150	0	-
Hori.	9760.000	PK	48.61	39.17	9.75	43.02	2.48	56.99	73.9	16.9	150	0	-
Hori.	4880.000	AV	39.41	31.64	6.99	42.83	2.48	37.69	53.9	16.2	150	0	Floor Noise
Hori.	7320.000	AV	39.61	37.46	8.45	43.52	2.48	44.48	53.9	9.4	150	0	Floor Noise
Hori.	9760.000	AV	39.55	39.17	9.75	43.02	2.48	47.93	53.9	5.9	150	0	Floor Noise
Vert.	4880.000	PK	48.62	31.64	6.99	42.83	2.48	46.90	73.9	27.0	150	0	-
Vert.	7320.000	PK	48.33	37.46	8.45	43.52	2.48	53.20	73.9	20.7	150	0	-
Vert.	9760.000	PK	48.03	39.17	9.75	43.02	2.48	56.41	73.9	17.4	150	0	-
Vert.	4880.000	AV	39.48	31.64	6.99	42.83	2.48	37.76	53.9	16.1	150	0	Floor Noise
Vert.	7320.000	AV	39.58	37.46	8.45	43.52	2.48	44.45	53.9	9.4	150	0	Floor Noise
Vert.	9760.000	AV	39.45	39.17	9.75	43.02	2.48	47.83	53.9	6.0	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 13, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 33 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Takahiro Suzuki	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz, Left		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.46	28.08	14.61	41.68	2.48	51.95	73.9	21.9	145	183	-
Hori.	4960.000	PK	48.67	31.81	7.05	42.80	2.48	47.21	73.9	26.6	150	0	-
Hori.	7440.000	PK	48.66	37.61	8.51	43.65	2.48	53.61	73.9	20.2	150	0	-
Hori.	9920.000	PK	48.86	39.03	9.83	42.82	2.48	57.38	73.9	16.5	150	0	-
Hori.	4960.000	AV	39.17	31.81	7.05	42.80	2.48	37.71	53.9	16.1	150	0	Floor Noise
Hori.	7440.000	AV	39.58	37.61	8.51	43.65	2.48	44.53	53.9	9.3	150	0	Floor Noise
Hori.	9920.000	AV	39.62	39.03	9.83	42.82	2.48	48.14	53.9	5.7	150	0	Floor Noise
Vert.	2483.500	PK	48.41	28.08	14.61	41.68	2.48	51.90	73.9	22.0	114	258	-
Vert.	4960.000	PK	48.11	31.81	7.05	42.80	2.48	46.65	73.9	27.2	150	0	-
Vert.	7440.000	PK	48.73	37.61	8.51	43.65	2.48	53.68	73.9	20.2	150	0	-
Vert.	9920.000	PK	48.67	39.03	9.83	42.82	2.48	57.19	73.9	16.7	150	0	-
Vert.	4960.000	AV	39.35	31.81	7.05	42.80	2.48	37.89	53.9	16.0	150	0	Floor Noise
Vert.	7440.000	AV	39.58	37.61	8.51	43.65	2.48	44.53	53.9	9.3	150	0	Floor Noise
Vert.	9920.000	AV	39.58	39.03	9.83	42.82	2.48	48.10	53.9	5.8	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

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	38.11	28.08	14.61	41.68	1.31	2.48	42.91	53.9	10.9	*1)
Vert.	2483.500	AV	37.95	28.08	14.61	41.68	1.31	2.48	42.75	53.9	11.1	*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 : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

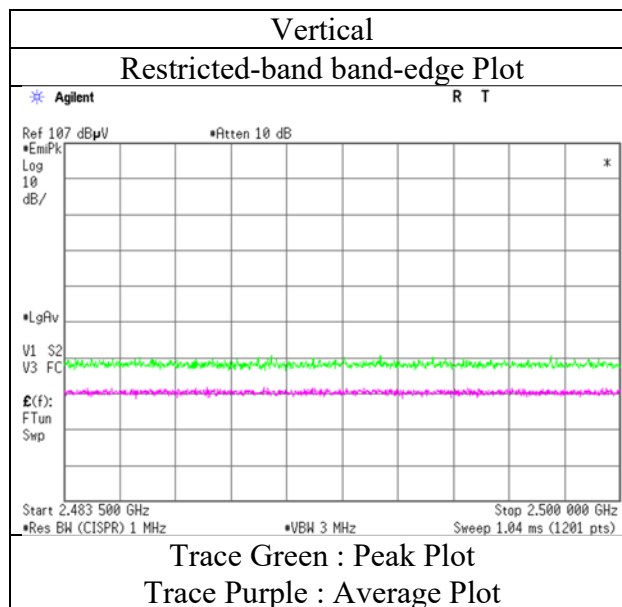
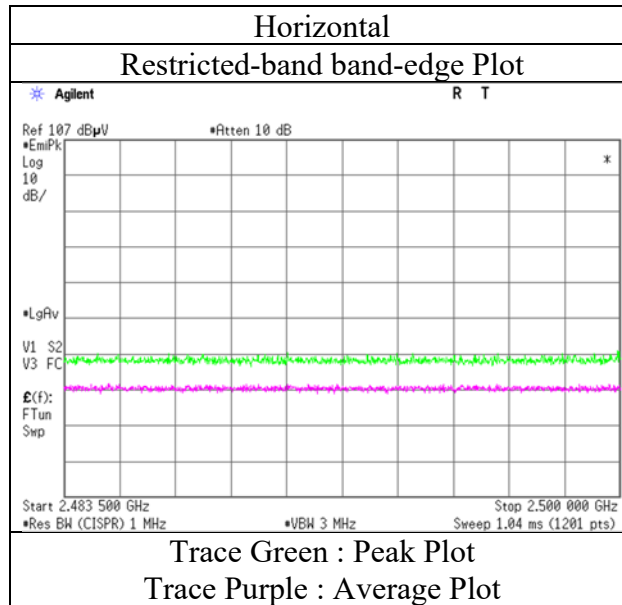
10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Burst rate confirmation" sheet.

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 13, 2023
Temperature / Humidity	23 deg.C, 33 %RH
Engineer	Takahiro Suzuki
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz, Left



* 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

Test place Shonan EMC Lab.
Semi Anechoic Chamber No.2 No.3 No.2
Date January 10, 2023 January 15, 2023 January 5, 2023
Temperature / Humidity 21 deg.C, 30 %RH 23 deg.C, 36 %RH 20 deg.C, 27 %RH
Engineer Kouki Yamada Yohsuke Matsuzawa Takahiro Kawakami
 (30 MHz -1 GHz) (1 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode Tx BT LE 2 M-PHY 2402 MHz, Left

(* 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.	31.912	QP	21.40	18.10	6.87	31.93	0.00	14.44	40.0	25.5	100	0	-
Hori.	35.398	QP	21.20	16.70	6.96	31.93	0.00	12.93	40.0	27.0	100	0	-
Hori.	191.989	QP	20.70	16.42	8.84	31.80	0.00	14.16	43.5	29.3	100	0	-
Hori.	908.393	QP	19.60	22.28	9.76	30.82	0.00	20.82	46.0	25.1	100	0	-
Hori.	2390.000	PK	47.22	28.18	14.49	41.63	2.48	50.74	73.9	23.1	145	41	-
Hori.	4804.000	PK	48.61	31.54	6.95	42.87	2.48	46.71	73.9	27.1	150	0	-
Hori.	7206.000	PK	48.33	37.37	8.41	43.39	2.48	53.20	73.9	20.7	150	0	-
Hori.	9608.000	PK	48.11	38.89	9.68	43.21	2.48	55.95	73.9	17.9	150	0	-
Hori.	4804.000	AV	39.26	31.54	6.95	42.87	2.48	37.36	53.9	16.5	150	0	Floor Noise
Hori.	7206.000	AV	39.36	37.37	8.41	43.39	2.48	44.23	53.9	9.6	150	0	Floor Noise
Hori.	9608.000	AV	38.55	38.89	9.68	43.21	2.48	46.39	53.9	7.5	150	0	Floor Noise
Vert.	30.070	QP	20.70	18.83	6.82	31.93	0.00	14.42	40.0	25.5	100	0	-
Vert.	34.144	QP	21.10	17.20	6.92	31.93	0.00	13.29	40.0	26.7	100	0	-
Vert.	182.706	QP	21.20	16.17	8.81	31.81	0.00	14.37	43.5	29.1	100	0	-
Vert.	912.106	QP	19.60	22.30	9.78	30.80	0.00	20.88	46.0	25.1	100	0	-
Vert.	2390.000	PK	47.58	28.18	14.49	41.63	2.48	51.10	73.9	22.8	143	77	-
Vert.	4804.000	PK	48.86	31.54	6.95	42.87	2.48	46.96	73.9	26.9	150	0	-
Vert.	7206.000	PK	48.52	37.37	8.41	43.39	2.48	53.39	73.9	20.5	150	0	-
Vert.	9608.000	PK	48.35	38.89	9.68	43.21	2.48	56.19	73.9	17.7	150	0	-
Vert.	4804.000	AV	39.36	31.54	6.95	42.87	2.48	37.46	53.9	16.4	150	0	Floor Noise
Vert.	7206.000	AV	39.43	37.37	8.41	43.39	2.48	44.30	53.9	9.6	150	0	Floor Noise
Vert.	9608.000	AV	38.79	38.89	9.68	43.21	2.48	46.63	53.9	7.2	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : 20log(3.99 m / 3.0 m) = 2.48 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	37.48	28.18	14.49	41.63	4.80	2.48	45.80	53.9	8.1	*1)
Vert.	2390.000	AV	37.38	28.18	14.49	41.63	4.80	2.48	45.70	53.9	8.2	*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(3.99 m / 3.0 m) = 2.48 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	87.46	28.17	14.51	41.64	2.48	90.98	-	-	Carrier
Hori.	2400.000	PK	55.56	28.17	14.51	41.64	2.48	59.08	70.9	11.8	-
Hori.	2400.156	PK	55.72	28.17	14.51	41.64	2.48	59.24	70.9	11.6	-
Vert.	2402.000	PK	87.03	28.17	14.51	41.64	2.48	90.55	-	-	Carrier
Vert.	2400.000	PK	54.86	28.17	14.51	41.64	2.48	58.38	70.5	12.1	-
Vert.	2400.176	PK	55.30	28.17	14.51	41.64	2.48	58.82	70.5	11.6	-

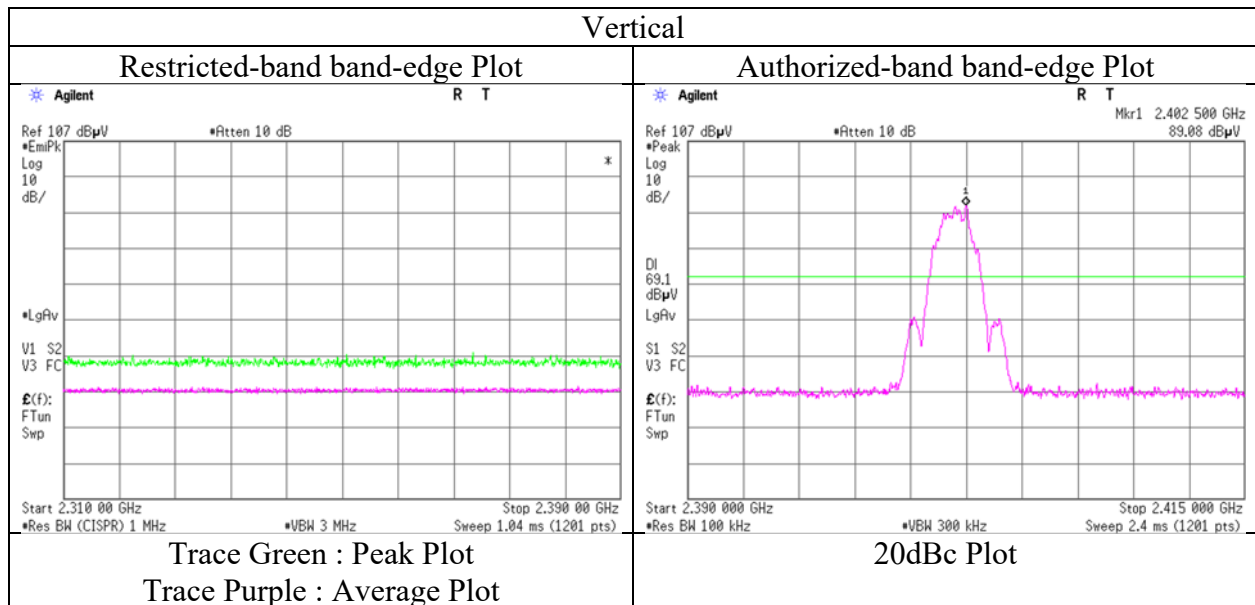
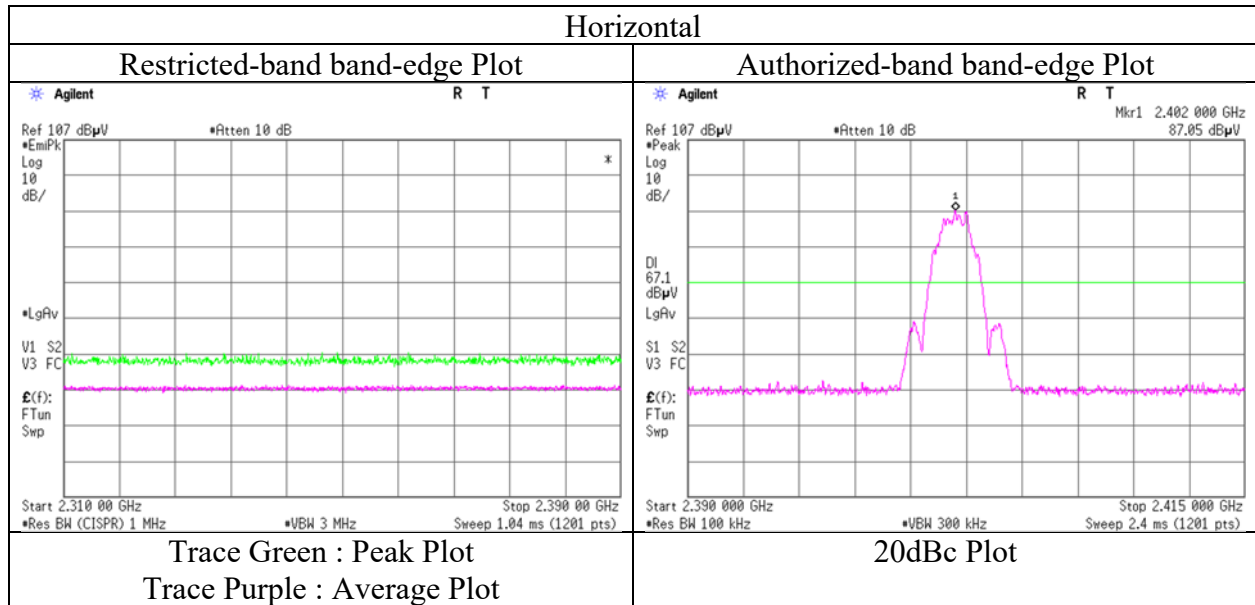
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log(3.99 m / 3.0 m) = 2.48 dB

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 15, 2023
Temperature / Humidity	23 deg.C, 36 %RH
Engineer	Yohsuke Matsuzawa
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz, Left



* 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

Test place Shonan EMC Lab.
Semi Anechoic Chamber No.3 No.2
Date January 15, 2023 January 5, 2023
Temperature / Humidity 23 deg.C, 36 %RH 20 deg.C, 27 %RH
Engineer Yohsuke Matsuzawa Takahiro Kawakami
January 15, 2023 January 5, 2023
Mode Tx BT LE 2 M-PHY 2440 MHz, Left

(* 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.	4880.000	PK	48.58	31.64	6.99	42.83	2.48	46.86	73.9	27.0	150	0	-
Hori.	7320.000	PK	48.36	37.46	8.45	43.52	2.48	53.23	73.9	20.6	150	0	-
Hori.	9760.000	PK	48.05	39.17	9.75	43.02	2.48	56.43	73.9	17.4	150	0	-
Hori.	4880.000	AV	39.37	31.64	6.99	42.83	2.48	37.65	53.9	16.2	150	0	Floor Noise
Hori.	7320.000	AV	39.87	37.46	8.45	43.52	2.48	44.74	53.9	9.1	150	0	Floor Noise
Hori.	9760.000	AV	39.39	39.17	9.75	43.02	2.48	47.77	53.9	6.1	150	0	Floor Noise
Vert.	4880.000	PK	48.31	31.64	6.99	42.83	2.48	46.59	73.9	27.3	150	0	-
Vert.	7320.000	PK	48.58	37.46	8.45	43.52	2.48	53.45	73.9	20.4	150	0	-
Vert.	9760.000	PK	48.68	39.17	9.75	43.02	2.48	57.06	73.9	16.8	150	0	-
Vert.	4880.000	AV	39.25	31.64	6.99	42.83	2.48	37.53	53.9	16.3	150	0	Floor Noise
Vert.	7320.000	AV	39.72	37.46	8.45	43.52	2.48	44.59	53.9	9.3	150	0	Floor Noise
Vert.	9760.000	AV	39.72	39.17	9.75	43.02	2.48	48.10	53.9	5.8	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz, Left	

(* 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	47.61	28.08	14.61	41.68	2.48	51.10	73.9	22.8	164	177	-
Hori.	4960.000	PK	48.63	31.81	7.05	42.80	2.48	47.17	73.9	26.7	150	0	-
Hori.	7440.000	PK	48.73	37.61	8.51	43.65	2.48	53.68	73.9	20.2	150	0	-
Hori.	9920.000	PK	48.05	39.03	9.83	42.82	2.48	56.57	73.9	17.3	150	0	-
Hori.	4960.000	AV	39.32	31.81	7.05	42.80	2.48	37.86	53.9	16.0	150	0	Floor Noise
Hori.	7440.000	AV	39.47	37.61	8.51	43.65	2.48	44.42	53.9	9.4	150	0	Floor Noise
Hori.	9920.000	AV	39.48	39.03	9.83	42.82	2.48	48.00	53.9	5.9	150	0	Floor Noise
Vert.	2483.500	PK	47.33	28.08	14.61	41.68	2.48	50.82	73.9	23.0	279	247	-
Vert.	4960.000	PK	48.37	31.81	7.05	42.80	2.48	46.91	73.9	26.9	150	0	-
Vert.	7440.000	PK	48.32	37.61	8.51	43.65	2.48	53.27	73.9	20.6	150	0	-
Vert.	9920.000	PK	49.54	39.03	9.83	42.82	2.48	58.06	73.9	15.8	150	0	-
Vert.	4960.000	AV	39.28	31.81	7.05	42.80	2.48	37.82	53.9	16.0	150	0	Floor Noise
Vert.	7440.000	AV	39.21	37.61	8.51	43.65	2.48	44.16	53.9	9.7	150	0	Floor Noise
Vert.	9920.000	AV	39.55	39.03	9.83	42.82	2.48	48.07	53.9	5.8	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

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	38.51	28.08	14.61	41.68	4.80	2.48	46.80	53.9	7.1	*1)
Vert.	2483.500	AV	38.48	28.08	14.61	41.68	4.80	2.48	46.77	53.9	7.1	*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 : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

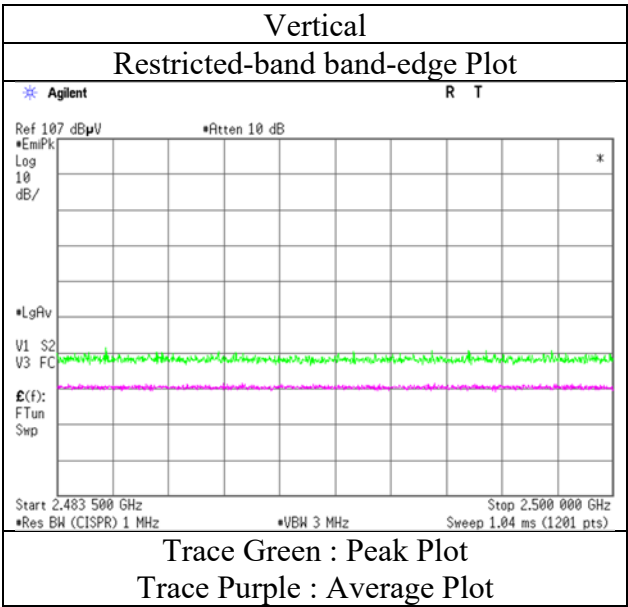
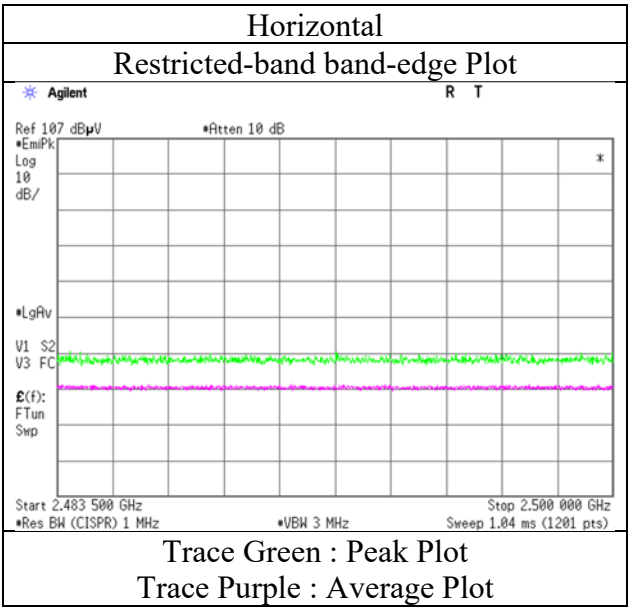
10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Burst rate confirmation" sheet.

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 15, 2023
Temperature / Humidity	23 deg.C, 36 %RH
Engineer	Yohsuke Matsuzawa
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz, Left



* 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

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 13, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 35 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Yohsuke Matsuzawa	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz, Right		

(* 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	47.31	28.18	14.49	41.63	2.48	50.83	73.9	23.0	146	269	-
Hori.	4804.000	PK	48.62	31.54	6.95	42.87	2.48	46.72	73.9	27.1	150	0	-
Hori.	7206.000	PK	48.65	37.37	8.41	43.39	2.48	53.52	73.9	20.3	150	0	-
Hori.	9608.000	PK	48.10	38.89	9.68	43.21	2.48	55.94	73.9	17.9	150	0	-
Hori.	4804.000	AV	39.51	31.54	6.95	42.87	2.48	37.61	53.9	16.2	150	0	Floor Noise
Hori.	7206.000	AV	39.14	37.37	8.41	43.39	2.48	44.01	53.9	9.8	150	0	Floor Noise
Hori.	9608.000	AV	38.86	38.89	9.68	43.21	2.48	46.70	53.9	7.2	150	0	Floor Noise
Vert.	2390.000	PK	47.25	28.18	14.49	41.63	2.48	50.77	73.9	23.1	158	132	-
Vert.	4804.000	PK	48.36	31.54	6.95	42.87	2.48	46.46	73.9	27.4	150	0	-
Vert.	7206.000	PK	48.35	37.37	8.41	43.39	2.48	53.22	73.9	20.6	150	0	-
Vert.	9608.000	PK	48.31	38.89	9.68	43.21	2.48	56.15	73.9	17.7	150	0	-
Vert.	4804.000	AV	39.43	31.54	6.95	42.87	2.48	37.53	53.9	16.3	150	0	Floor Noise
Vert.	7206.000	AV	39.45	37.37	8.41	43.39	2.48	44.32	53.9	9.5	150	0	Floor Noise
Vert.	9608.000	AV	38.72	38.89	9.68	43.21	2.48	46.56	53.9	7.3	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$ 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.	2390.000	AV	36.32	28.18	14.49	41.63	1.31	2.48	41.15	53.9	12.7	*1)
Vert.	2390.000	AV	36.32	28.18	14.49	41.63	1.31	2.48	41.15	53.9	12.7	*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 : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$ 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)

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

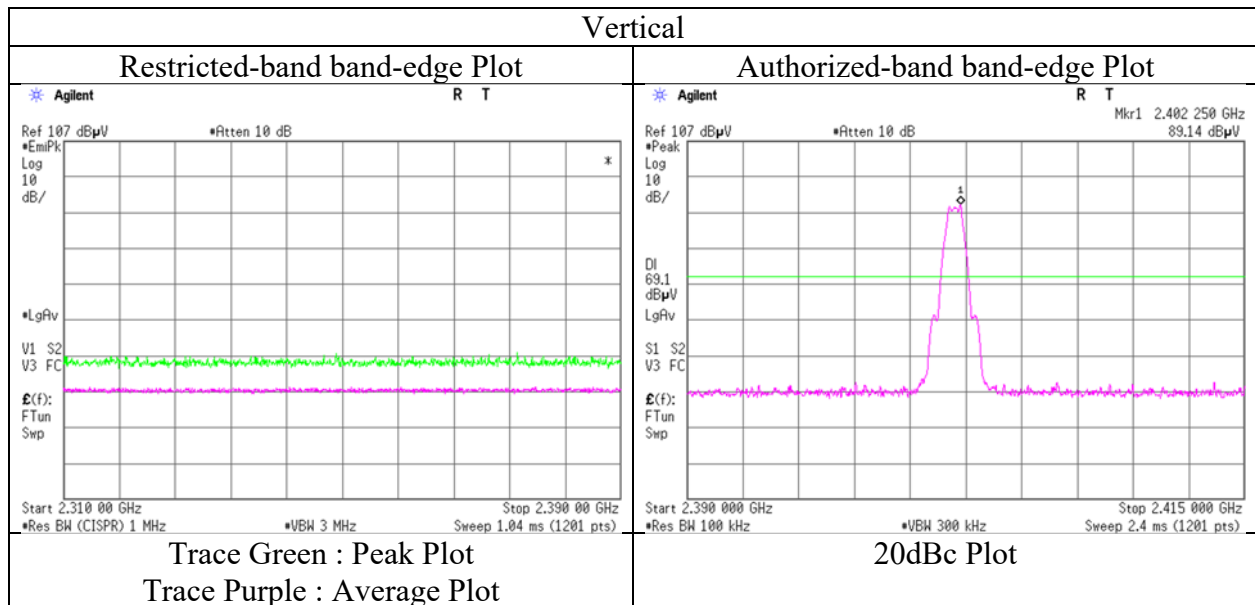
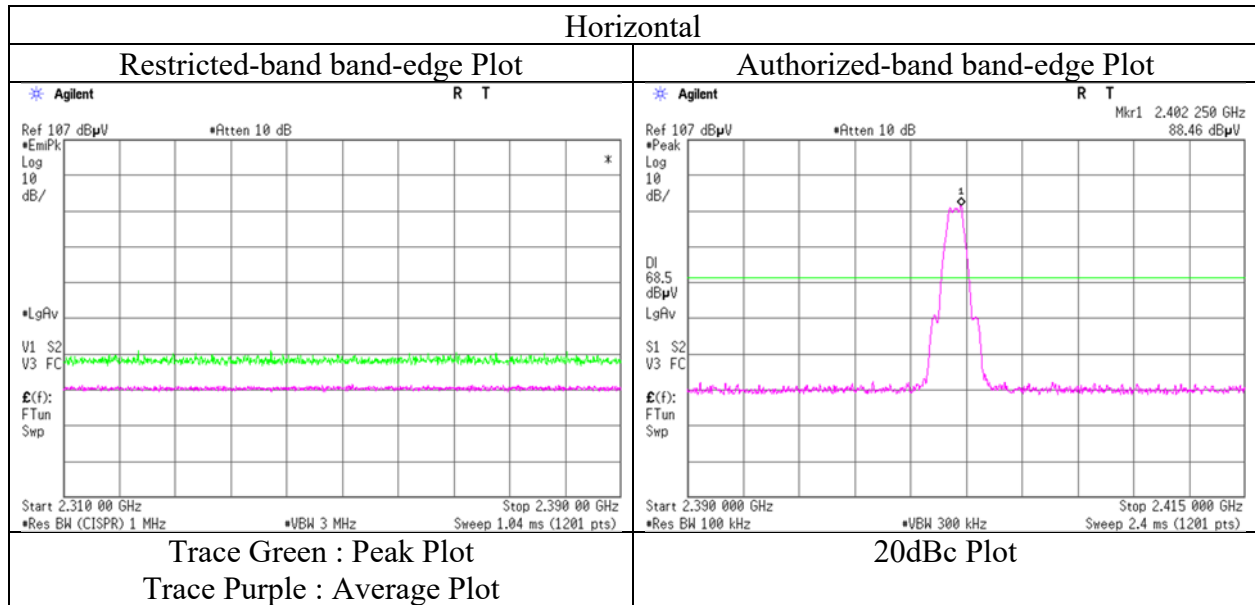
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	88.47	28.17	14.51	41.64	2.48	91.99	-	-	Carrier
Hori.	2400.000	PK	37.43	28.17	14.51	41.64	2.48	40.95	71.9	30.9	-
Vert.	2402.000	PK	89.15	28.17	14.51	41.64	2.48	92.67	-	-	Carrier
Vert.	2400.000	PK	37.85	28.17	14.51	41.64	2.48	41.37	72.6	31.2	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$ 10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 13, 2023
Temperature / Humidity	23 deg.C, 35 %RH
Engineer	Yohsuke Matsuzawa
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz, Right



* 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

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 13, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 35 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Yohsuke Matsuzawa	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2440 MHz, Right		

(* 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.	4880.000	PK	48.56	31.64	6.99	42.83	2.48	46.84	73.9	27.0	150	0	-
Hori.	7320.000	PK	48.87	37.46	8.45	43.52	2.48	53.74	73.9	20.1	150	0	-
Hori.	9760.000	PK	48.82	39.17	9.75	43.02	2.48	57.20	73.9	16.7	150	0	-
Hori.	4880.000	AV	39.37	31.64	6.99	42.83	2.48	37.65	53.9	16.2	150	0	Floor Noise
Hori.	7320.000	AV	39.65	37.46	8.45	43.52	2.48	44.52	53.9	9.3	150	0	Floor Noise
Hori.	9760.000	AV	39.55	39.17	9.75	43.02	2.48	47.93	53.9	5.9	150	0	Floor Noise
Vert.	4880.000	PK	48.35	31.64	6.99	42.83	2.48	46.63	73.9	27.2	150	0	-
Vert.	7320.000	PK	48.56	37.46	8.45	43.52	2.48	53.43	73.9	20.4	150	0	-
Vert.	9760.000	PK	48.46	39.17	9.75	43.02	2.48	56.84	73.9	17.0	150	0	-
Vert.	4880.000	AV	39.32	31.64	6.99	42.83	2.48	37.60	53.9	16.3	150	0	Floor Noise
Vert.	7320.000	AV	39.87	37.46	8.45	43.52	2.48	44.74	53.9	9.1	150	0	Floor Noise
Vert.	9760.000	AV	39.83	39.17	9.75	43.02	2.48	48.21	53.9	5.6	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.2
Date	January 13, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 33 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Takahiro Suzuki	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz, Right		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.76	28.08	14.61	41.68	2.48	52.25	73.9	21.6	111	7	-
Hori.	4960.000	PK	48.31	31.81	7.05	42.80	2.48	46.85	73.9	27.0	150	0	-
Hori.	7440.000	PK	48.86	37.61	8.51	43.65	2.48	53.81	73.9	20.0	150	0	-
Hori.	9920.000	PK	48.76	39.03	9.83	42.82	2.48	57.28	73.9	16.6	150	0	-
Hori.	4960.000	AV	39.30	31.81	7.05	42.80	2.48	37.84	53.9	16.0	150	0	Floor Noise
Hori.	7440.000	AV	39.58	37.61	8.51	43.65	2.48	44.53	53.9	9.3	150	0	Floor Noise
Hori.	9920.000	AV	39.71	39.03	9.83	42.82	2.48	48.23	53.9	5.6	150	0	Floor Noise
Vert.	2483.500	PK	48.64	28.08	14.61	41.68	2.48	52.13	73.9	21.7	146	87	-
Vert.	4960.000	PK	48.85	31.81	7.05	42.80	2.48	47.39	73.9	26.5	150	0	-
Vert.	7440.000	PK	48.87	37.61	8.51	43.65	2.48	53.82	73.9	20.0	150	0	-
Vert.	9920.000	PK	48.78	39.03	9.83	42.82	2.48	57.30	73.9	16.6	150	0	-
Vert.	4960.000	AV	39.23	31.81	7.05	42.80	2.48	37.77	53.9	16.1	150	0	Floor Noise
Vert.	7440.000	AV	39.52	37.61	8.51	43.65	2.48	44.47	53.9	9.4	150	0	Floor Noise
Vert.	9920.000	AV	39.81	39.03	9.83	42.82	2.48	48.33	53.9	5.5	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$
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	38.08	28.08	14.61	41.68	1.31	2.48	42.88	53.9	11.0	*1)
Vert.	2483.500	AV	38.24	28.08	14.61	41.68	1.31	2.48	43.04	53.9	10.8	*1)

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

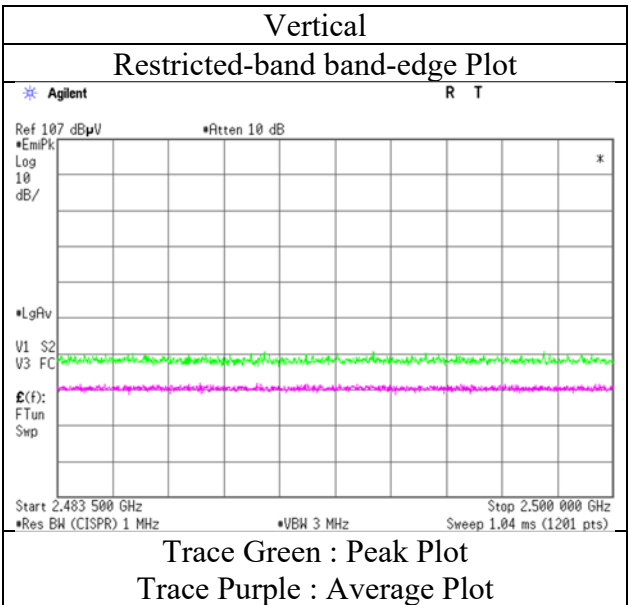
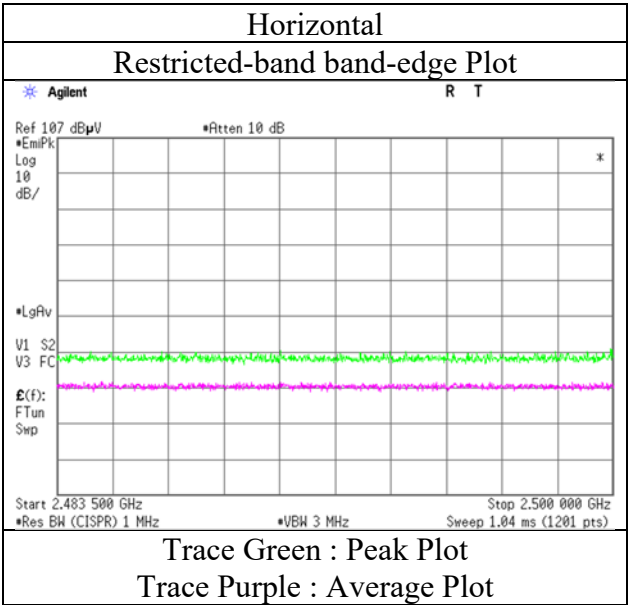
Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$
10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Burst rate confirmation" sheet.

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 13, 2023
Temperature / Humidity	23 deg.C, 33 %RH
Engineer	Takahiro Suzuki
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz, Right



* 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

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.3	No.2
Date	January 10, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	21 deg.C, 30 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Kouki Yamada	Yohsuke Matsuzawa	Takahiro Kawakami
	(30 MHz -1 GHz)	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz, Right		

(* 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.	32.146	QP	21.40	18.00	6.88	31.93	0.00	14.35	40.0	25.6	100	0	-
Hori.	33.889	QP	20.90	17.29	6.92	31.93	0.00	13.18	40.0	26.8	100	0	-
Hori.	877.394	QP	19.90	22.04	9.62	30.99	0.00	20.57	46.0	25.4	100	0	-
Hori.	2390.000	PK	47.36	28.18	14.49	41.63	2.48	50.88	73.9	23.0	149	255	-
Hori.	4804.000	PK	48.36	31.54	6.95	42.87	2.48	46.46	73.9	27.4	150	0	-
Hori.	7206.000	PK	48.62	37.37	8.41	43.39	2.48	53.49	73.9	20.4	150	0	-
Hori.	9608.000	PK	48.53	38.89	9.68	43.21	2.48	56.37	73.9	17.5	150	0	-
Hori.	4804.000	AV	39.43	31.54	6.95	42.87	2.48	37.53	53.9	16.3	150	0	Floor Noise
Hori.	7206.000	AV	39.22	37.37	8.41	43.39	2.48	44.09	53.9	9.8	150	0	Floor Noise
Hori.	9608.000	AV	38.77	38.89	9.68	43.21	2.48	46.61	53.9	7.2	150	0	Floor Noise
Vert.	30.891	QP	21.60	18.50	6.85	31.93	0.00	15.02	40.0	24.9	100	0	-
Vert.	32.381	QP	21.00	17.90	6.88	31.93	0.00	13.85	40.0	26.1	100	0	-
Vert.	158.627	QP	21.40	15.21	8.76	31.83	0.00	13.54	43.5	29.9	100	0	-
Vert.	934.301	QP	19.70	22.14	9.88	30.69	0.00	21.03	46.0	24.9	100	0	-
Vert.	2390.000	PK	47.62	28.18	14.49	41.63	2.48	51.14	73.9	22.7	151	97	-
Vert.	4804.000	PK	48.76	31.54	6.95	42.87	2.48	46.86	73.9	27.0	150	0	-
Vert.	7206.000	PK	48.63	37.37	8.41	43.39	2.48	53.50	73.9	20.4	150	0	-
Vert.	9608.000	PK	48.36	38.89	9.68	43.21	2.48	56.20	73.9	17.7	150	0	-
Vert.	4804.000	AV	39.52	31.54	6.95	42.87	2.48	37.62	53.9	16.2	150	0	Floor Noise
Vert.	7206.000	AV	39.43	37.37	8.41	43.39	2.48	44.30	53.9	9.6	150	0	Floor Noise
Vert.	9608.000	AV	39.06	38.89	9.68	43.21	2.48	46.90	53.9	7.0	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 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	38.13	28.18	14.49	41.63	4.80	2.48	46.45	53.9	7.4	*1)
Vert.	2390.000	AV	38.35	28.18	14.49	41.63	4.80	2.48	46.67	53.9	7.2	*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 (3.99 m / 3.0 m) = 2.48 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	87.12	28.17	14.51	41.64	2.48	90.64	-	-	Carrier
Hori.	2400.000	PK	54.93	28.17	14.51	41.64	2.48	58.45	70.6	12.1	-
Hori.	2400.139	PK	55.30	28.17	14.51	41.64	2.48	58.82	70.6	11.7	-
Vert.	2402.000	PK	88.83	28.17	14.51	41.64	2.48	92.35	-	-	Carrier
Vert.	2400.000	PK	57.35	28.17	14.51	41.64	2.48	60.87	72.3	11.4	-
Vert.	2400.168	PK	57.40	28.17	14.51	41.64	2.48	60.92	72.3	11.3	-

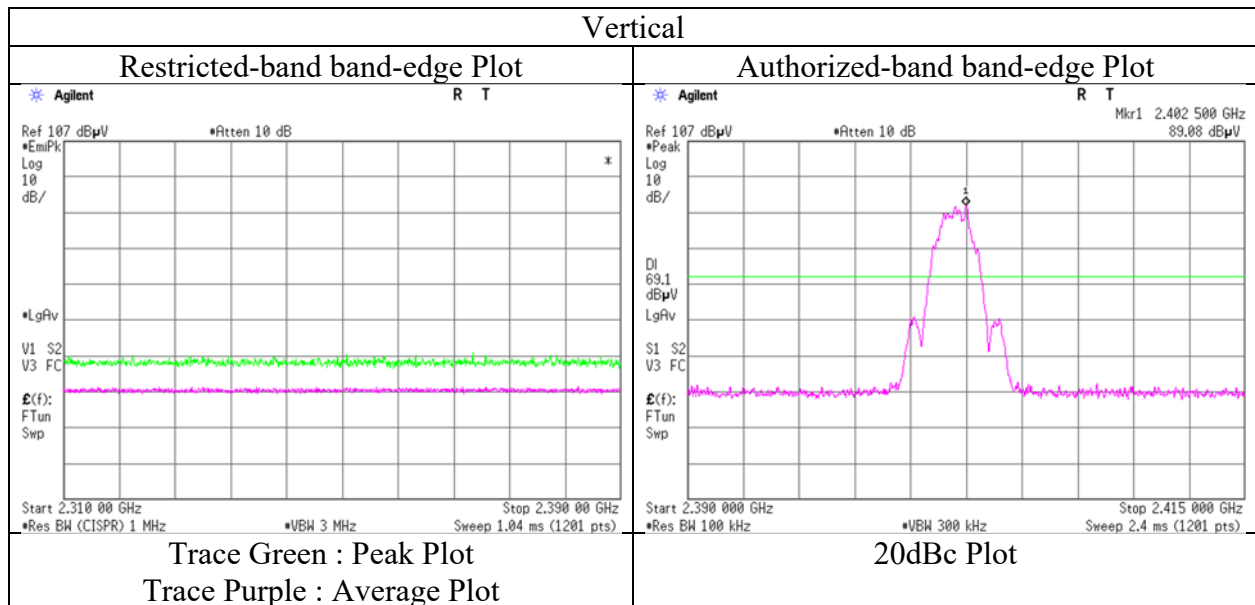
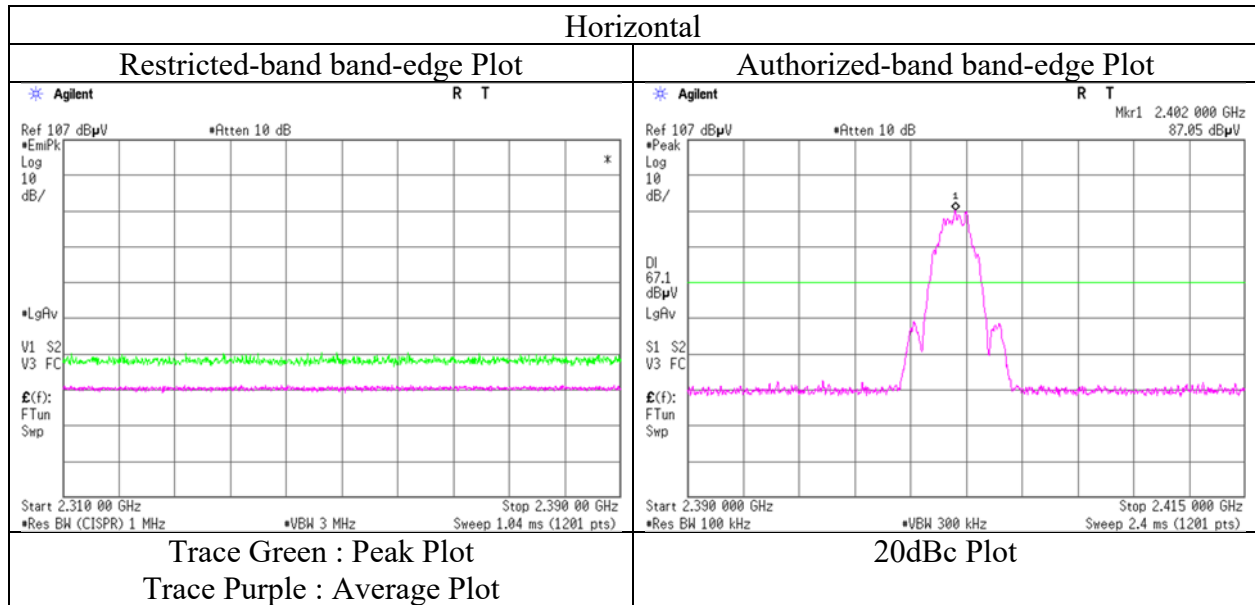
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 15, 2023
Temperature / Humidity	23 deg.C, 36 %RH
Engineer	Yohsuke Matsuzawa
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz, Right



* 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

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2440 MHz, Right	

(* 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.	4880.000	PK	48.56	31.64	6.99	42.83	2.48	46.84	73.9	27.0	150	0	-
Hori.	7320.000	PK	48.77	37.46	8.45	43.52	2.48	53.64	73.9	20.2	150	0	-
Hori.	9760.000	PK	48.55	39.17	9.75	43.02	2.48	56.93	73.9	16.9	150	0	-
Hori.	4880.000	AV	39.28	31.64	6.99	42.83	2.48	37.56	53.9	16.3	150	0	Floor Noise
Hori.	7320.000	AV	39.43	37.46	8.45	43.52	2.48	44.30	53.9	9.6	150	0	Floor Noise
Hori.	9760.000	AV	39.57	39.17	9.75	43.02	2.48	47.95	53.9	5.9	150	0	Floor Noise
Vert.	4880.000	PK	48.88	31.64	6.99	42.83	2.48	47.16	73.9	26.7	150	0	-
Vert.	7320.000	PK	48.55	37.46	8.45	43.52	2.48	53.42	73.9	20.4	150	0	-
Vert.	9760.000	PK	48.63	39.17	9.75	43.02	2.48	57.01	73.9	16.8	150	0	-
Vert.	4880.000	AV	39.43	31.64	6.99	42.83	2.48	37.71	53.9	16.1	150	0	Floor Noise
Vert.	7320.000	AV	39.62	37.46	8.45	43.52	2.48	44.49	53.9	9.4	150	0	Floor Noise
Vert.	9760.000	AV	39.86	39.17	9.75	43.02	2.48	48.24	53.9	5.6	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	January 15, 2023	January 5, 2023
Temperature / Humidity	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Yohsuke Matsuzawa	Takahiro Kawakami
	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz, Right	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.60	28.08	14.61	41.68	2.48	52.09	73.9	21.8	144	327	-
Hori.	4960.000	PK	48.38	31.81	7.05	42.80	2.48	46.92	73.9	26.9	150	0	-
Hori.	7440.000	PK	48.78	37.61	8.51	43.65	2.48	53.73	73.9	20.1	150	0	-
Hori.	9920.000	PK	48.75	39.03	9.83	42.82	2.48	57.27	73.9	16.6	150	0	-
Hori.	4960.000	AV	39.35	31.81	7.05	42.80	2.48	37.89	53.9	16.0	150	0	Floor Noise
Hori.	7440.000	AV	39.71	37.61	8.51	43.65	2.48	44.66	53.9	9.2	150	0	Floor Noise
Hori.	9920.000	AV	39.66	39.03	9.83	42.82	2.48	48.18	53.9	5.7	150	0	Floor Noise
Vert.	2483.500	PK	47.87	28.08	14.61	41.68	2.48	51.36	73.9	22.5	261	151	-
Vert.	4960.000	PK	48.65	31.81	7.05	42.80	2.48	47.19	73.9	26.7	150	0	-
Vert.	7440.000	PK	48.88	37.61	8.51	43.65	2.48	53.83	73.9	20.0	150	0	-
Vert.	9920.000	PK	48.53	39.03	9.83	42.82	2.48	57.05	73.9	16.8	150	0	-
Vert.	4960.000	AV	39.15	31.81	7.05	42.80	2.48	37.69	53.9	16.2	150	0	Floor Noise
Vert.	7440.000	AV	39.51	37.61	8.51	43.65	2.48	44.46	53.9	9.4	150	0	Floor Noise
Vert.	9920.000	AV	39.83	39.03	9.83	42.82	2.48	48.35	53.9	5.5	150	0	Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$ 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	38.15	28.08	14.61	41.68	4.80	2.48	46.44	53.9	7.4	*1)
Vert.	2483.500	AV	38.38	28.08	14.61	41.68	4.80	2.48	46.67	53.9	7.2	*1)

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

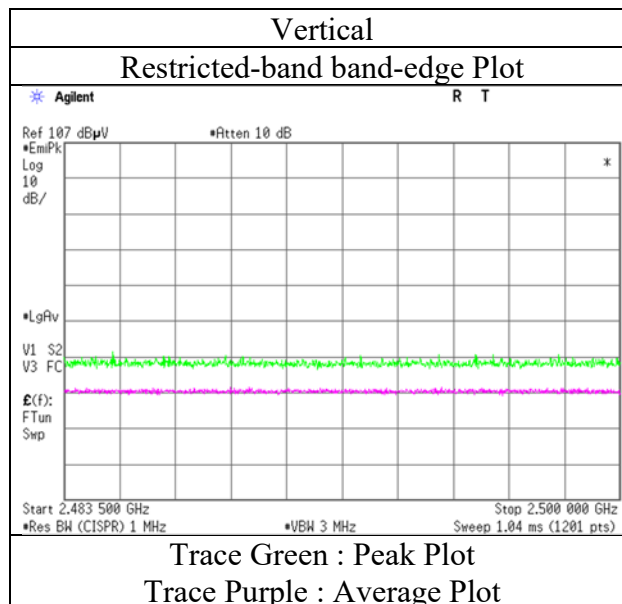
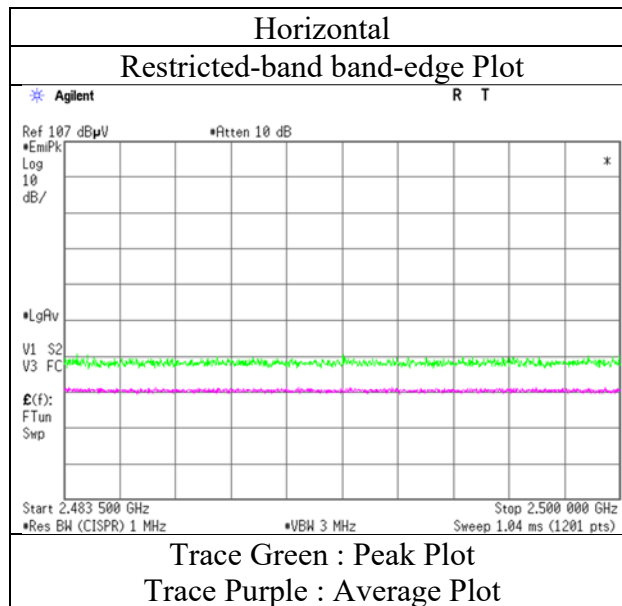
Distance factor : 1 GHz - 10 GHz : $20\log(3.99\text{ m} / 3.0\text{ m}) = 2.48\text{ dB}$ 10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Burst rate confirmation" sheet.

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

Radiated Spurious Emission (Reference Plot for band-edge)

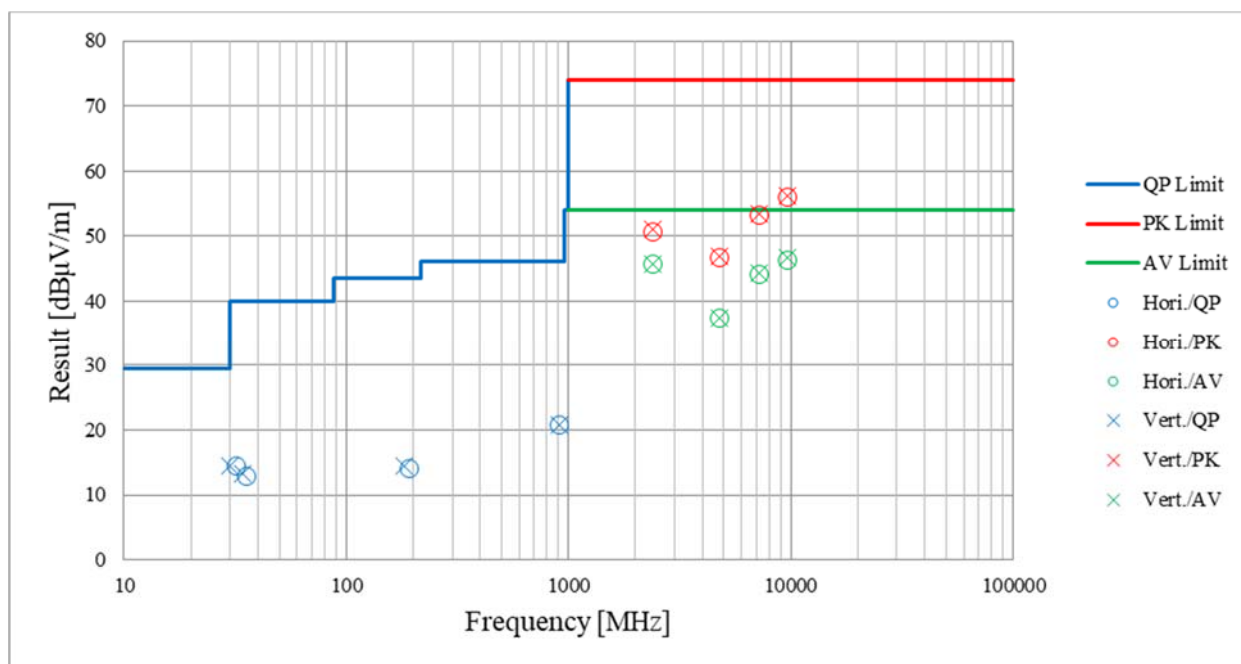
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 15, 2023
Temperature / Humidity	23 deg.C, 36 %RH
Engineer	Yohsuke Matsuzawa
	(1 GHz -2.8 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz, Right



* 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 mode for Maximum Peak Output Power)

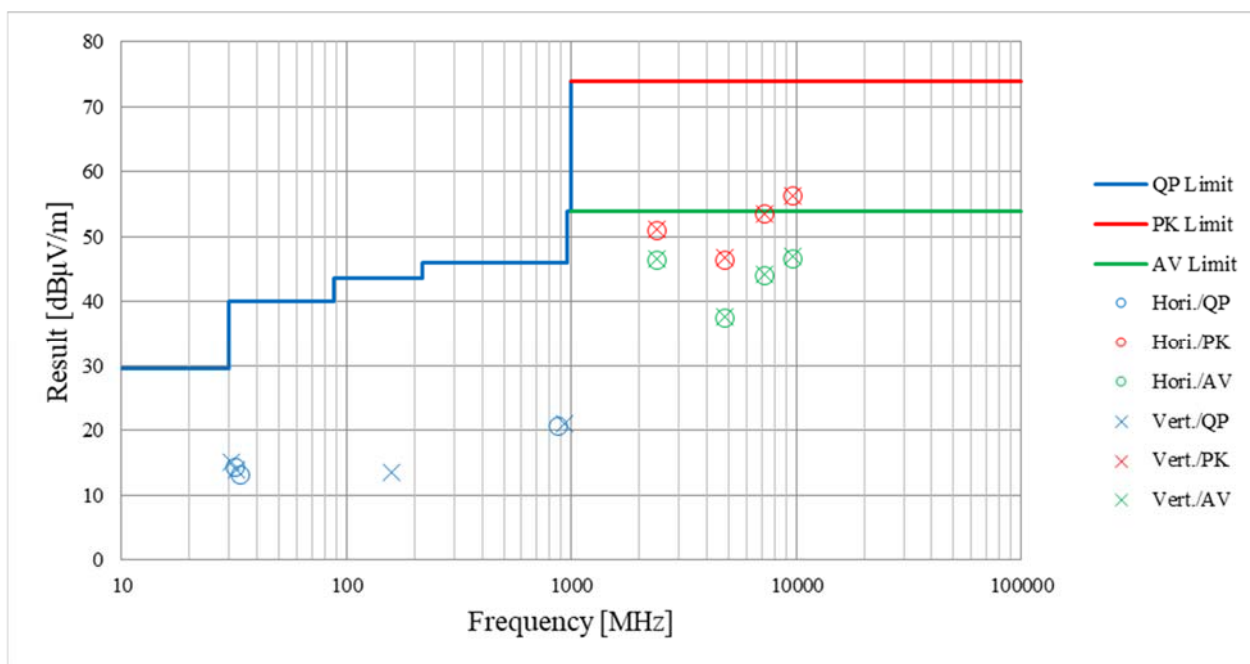
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.3	No.2
Date	January 10, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	21 deg.C, 30 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Kouki Yamada	Yohsuke Matsuzawa	Takahiro Kawakami
	(30 MHz -1 GHz)	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz, Left		



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

Radiated Spurious Emission (Plot data, Worst case mode for Maximum Peak Output Power)

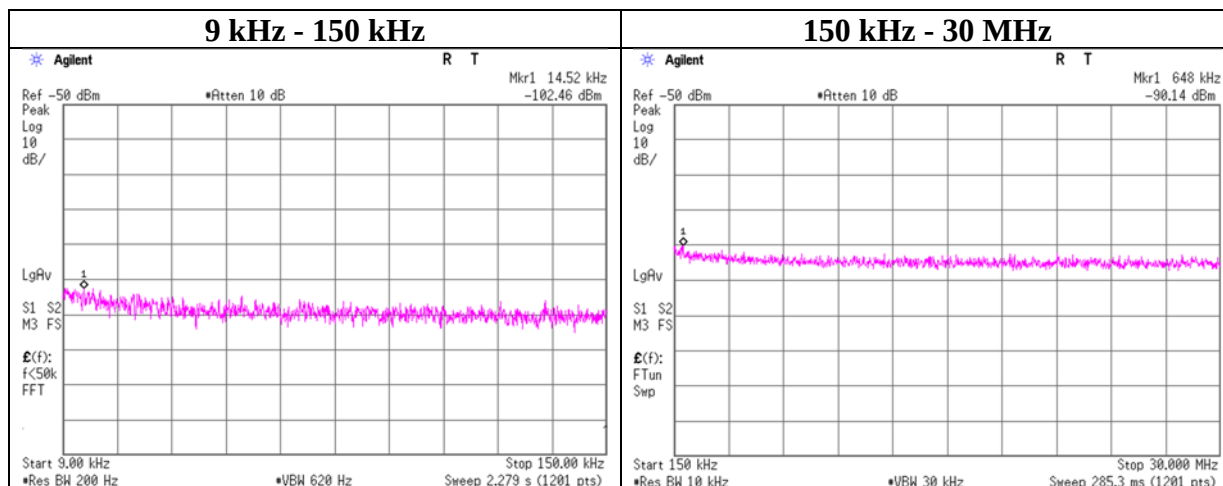
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.3	No.2
Date	January 10, 2023	January 15, 2023	January 5, 2023
Temperature / Humidity	21 deg.C, 30 %RH	23 deg.C, 36 %RH	20 deg.C, 27 %RH
Engineer	Kouki Yamada	Yohsuke Matsuzawa	Takahiro Kawakami
	(30 MHz -1 GHz)	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz, Right		



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

Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date December 26, 2022
Temperature / Humidity 22 deg. C / 25 % RH
Engineer Miku Ikudome
Mode Tx BT LE 1 M-PHY 2402 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
14.52	-102.5	0.6	9.8	2.0	1	-90.1	300	6.0	-28.8	44.3	73.1	-
648.00	-90.1	0.6	9.8	2.0	1	-77.7	30	6.0	3.5	31.3	27.8	-

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

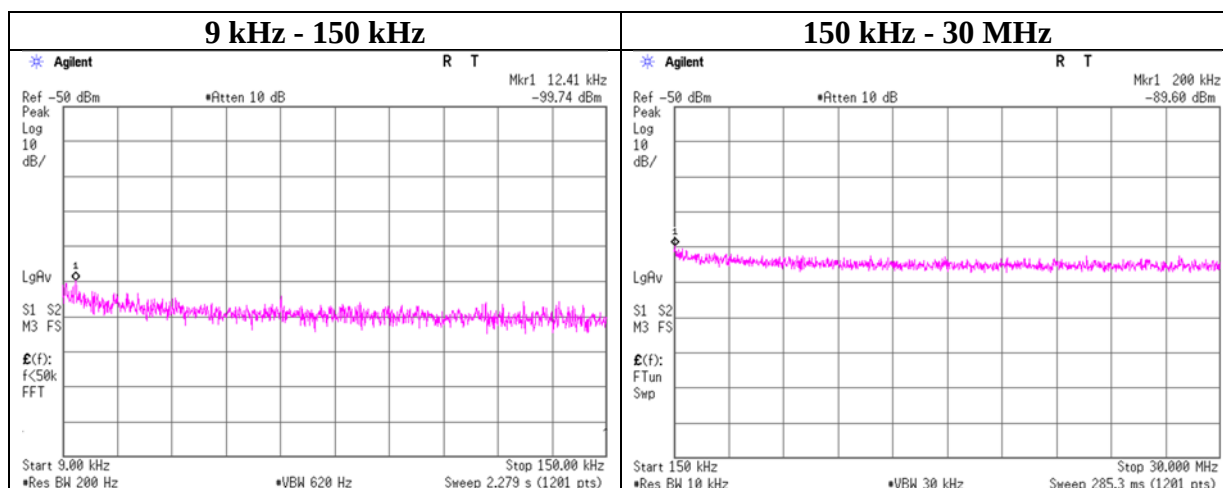
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$

N: Number of output

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

Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date December 26, 2022
Temperature / Humidity 22 deg. C / 25 % RH
Engineer Miku Ikudome
Mode Tx BT LE 1 M-PHY 2440 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
12.41	-99.7	0.6	9.8	2.0	1	-87.3	300	6.0	-26.1	45.7	71.8	-
200.00	-89.6	0.6	9.8	2.0	1	-77.2	300	6.0	-15.9	21.5	37.4	-

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

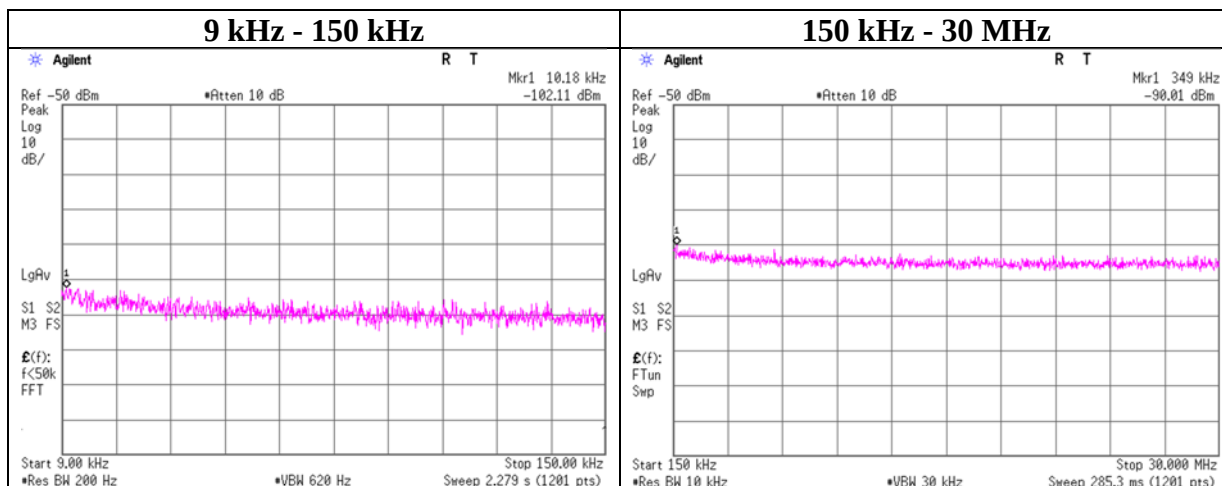
$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date December 26, 2022
Temperature / Humidity 22 deg. C / 25 % RH
Engineer Miku Ikudome
Mode Tx BT LE 1 M-PHY 2480 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
10.18	-102.1	0.6	9.8	2.0	1	-89.7	300	6.0	-28.5	47.4	75.9	-
349.00	-90.0	0.6	9.8	2.0	1	-77.6	300	6.0	-16.4	16.7	33.1	-

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

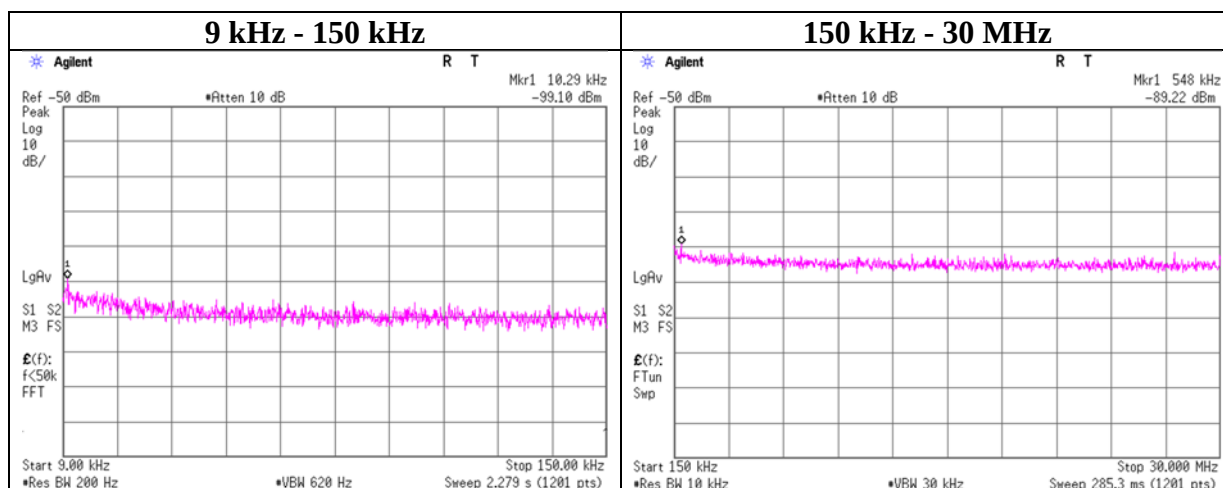
$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date December 26, 2022
Temperature / Humidity 22 deg. C / 25 % RH
Engineer Miku Ikudome
Mode Tx BT LE 2 M-PHY 2402 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
10.29	-99.1	0.6	9.8	2.0	1	-86.7	300	6.0	-25.4	47.3	72.7	-
548.00	-89.2	0.6	9.8	2.0	1	-76.8	30	6.0	4.4	32.8	28.4	-

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

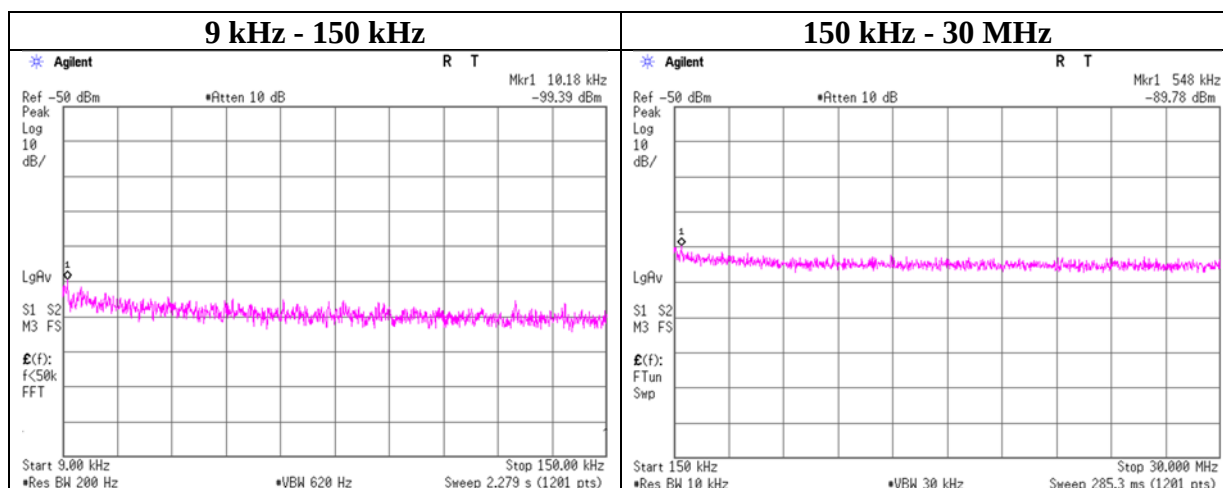
$EIRP[dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date December 26, 2022
Temperature / Humidity 22 deg. C / 25 % RH
Engineer Miku Ikudome
Mode Tx BT LE 2 M-PHY 2440 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
10.18	-99.4	0.6	9.8	2.0	1	-87.0	300	6.0	-25.7	47.4	73.1	-
548.00	-89.8	0.6	9.8	2.0	1	-77.4	30	6.0	3.9	32.8	28.9	-

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

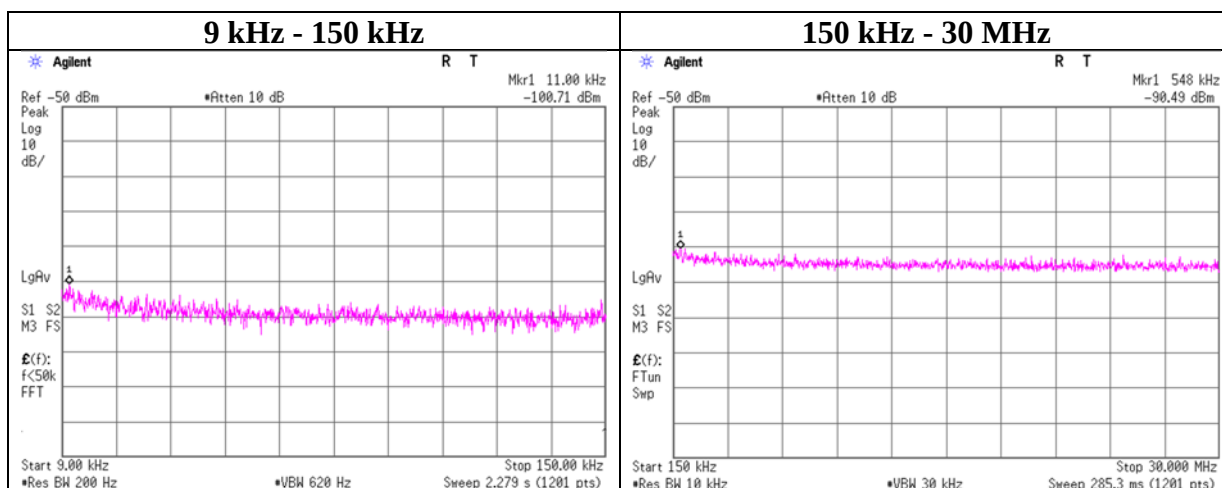
$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Test place Shonan EMC Lab. No.5 Shielded Room
Date December 26, 2022
Temperature / Humidity 22 deg. C / 25 % RH
Engineer Miku Ikudome
Mode Tx BT LE 2 M-PHY 2480 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
11.00	-100.7	0.6	9.8	2.0	1	-88.3	300	6.0	-27.1	46.7	73.8	-
548.00	-90.5	0.6	9.8	2.0	1	-78.1	30	6.0	3.2	32.8	29.6	-

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

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

N: Number of output

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

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	January 16, 2023
Temperature / Humidity	25 deg. C / 49 % RH
Engineer	Takahiro Kawakami
Mode	Tx

BT LE 1 M-PHY

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2402	2402.016	-19.03	1.25	9.88	-7.90	8.00	15.90
2440	2440.016	-19.22	1.26	9.88	-8.08	8.00	16.08
2480	2480.016	-19.39	1.26	9.89	-8.24	8.00	16.24

BT LE 2 M-PHY

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2402	2401.964	-22.10	1.25	9.88	-10.97	8.00	18.97
2440	2439.964	-22.36	1.26	9.88	-11.22	8.00	19.22
2480	2479.964	-22.47	1.26	9.89	-11.32	8.00	19.32

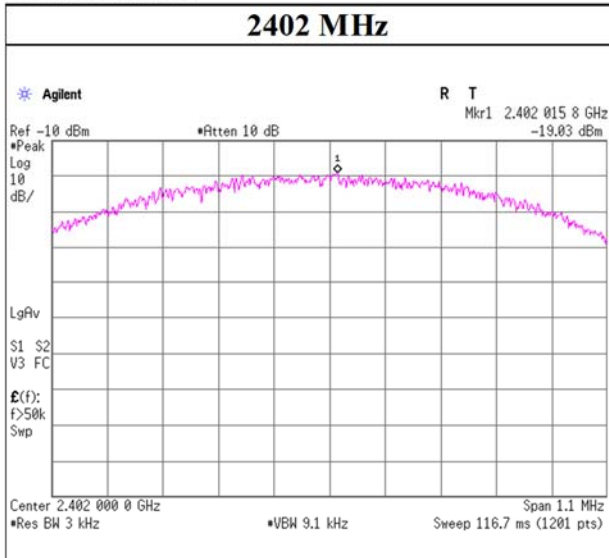
Sample Calculation:

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

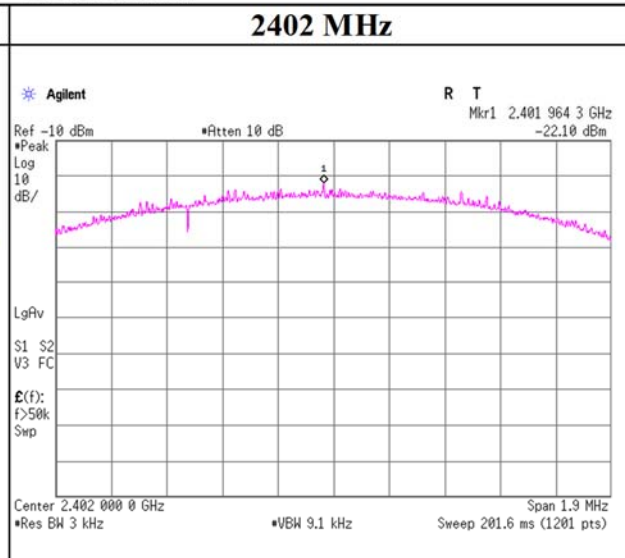
*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density

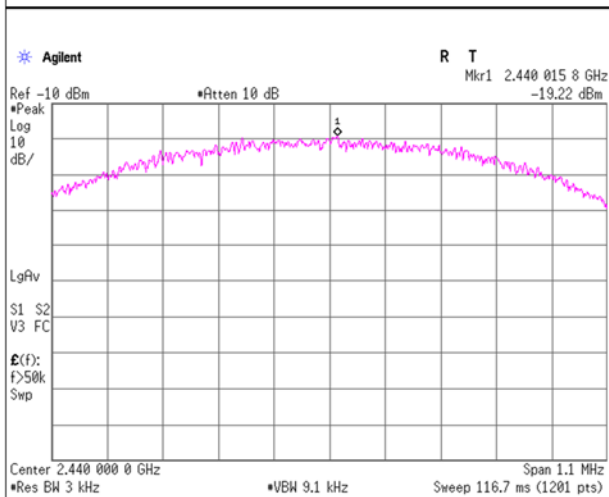
BT LE1 M-PHY



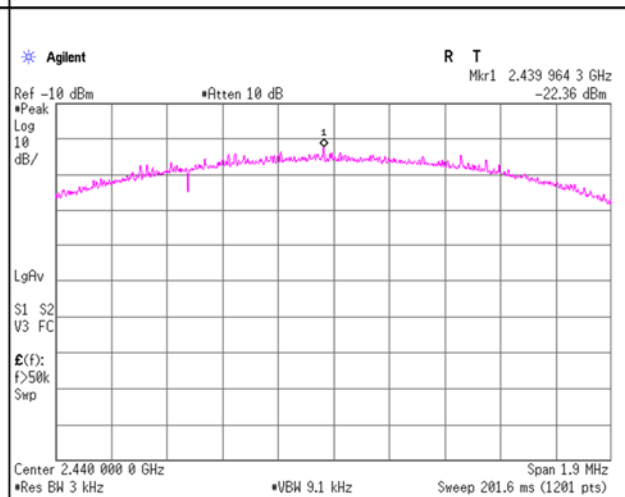
BT LE2 M-PHY



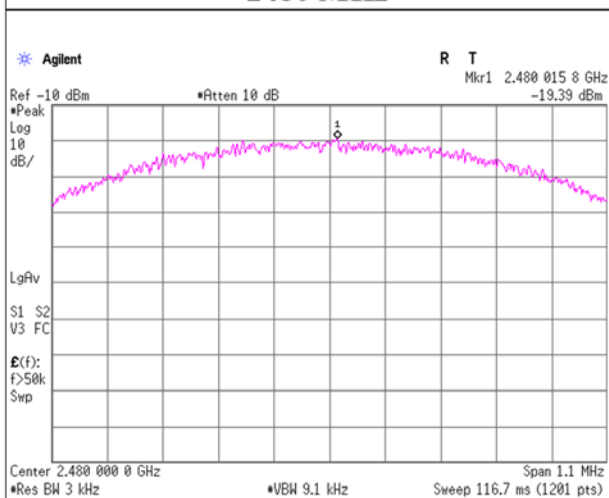
2440 MHz



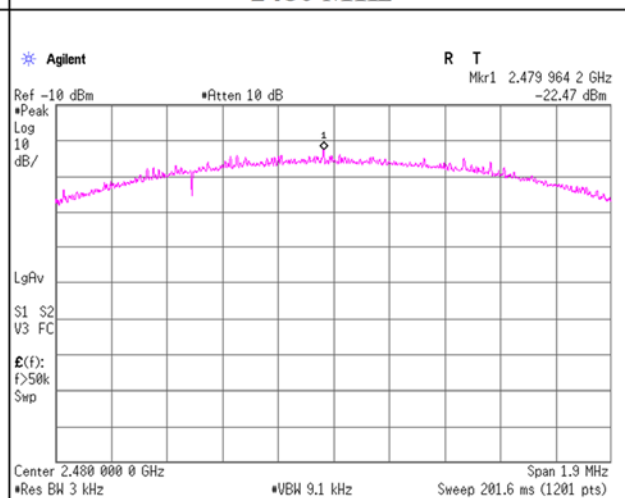
2440 MHz



2480 MHz



2480 MHz



APPENDIX 2: Test Instruments

Test Equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2022/11/01	12
AT	SAT10-16	160494	Attenuator	Weinschel Corp.	54A-10	83420	2022/12/01	12
AT	SCC-G64	196945	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803414/2	2022/03/01	12
AT	SOS-27	191845	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2022/11/08	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2022/11/08	12
AT	STS-05	146212	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997828	2022/09/20	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	SAEC-02(NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2022/03/20	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2022/05/18	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2022/02/24	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2022/05/12	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2022/02/04	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2022/03/03	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2022/10/20	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2022/02/21	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2022/02/21	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032665	2022/04/16	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	2022/04/20	12
RE	SCC-B2/B4/B6/B7/B8/B13/SRSE-02	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	2022/04/20	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2022/03/03	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2022/01/06	12
RE	SCC-G43	156380	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	SN MY 13406/4E	2022/05/20	12
RE	SCC-G44	168300	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800375/4A	2022/11/10	12
RE	SCC-G50	178573	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	MY13407/4E	2022/03/03	12
RE	SCC-G51	178572	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800288 /4A	2022/03/03	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2022/05/12	12
RE	SCC-G69	200009	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575617/4	2022/07/21	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2022/10/20	12
RE	SFL-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2022/03/02	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-739	2022/03/16	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2022/06/06	12
RE	SHA-09	194684	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	695	2022/03/10	12
RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-

RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2022/04/16	12
RE	SOS-21	191838	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
RE	SOS-23	191840	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
RE	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2022/08/04	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2022/09/14	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2022/03/02	12
RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2022/04/07	12
RE	STS-03	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2022/09/20	12

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

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

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

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

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