



RADIO TEST REPORT

Test Report No.: 14614315H-A

Customer	Sony Interactive Entertainment Inc.
Description of EUT	Wireless communication module
Model Number of EUT	AW-XM501
FCC ID	AK8M20DAL1
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied (Refer to SECTION 3)
Issue Date	February 17, 2023
Remarks	Bluetooth Low Energy part, For Permissive change, Radiated Spurious Emission test only

Representative Test Engineer

Hiroki Numata
Engineer

Approved By

Takayuki Shimada
Leader



CERTIFICATE 5107.02

- ☐ 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. Ise 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.: 14614315H-A

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14614315H-A	February 17, 2023	-

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	8
SECTION 4: Operation of EUT during testing.....	11
SECTION 5: Radiated Spurious Emission	13
APPENDIX 1: Test Data	15
Burst rate confirmation	15
Radiated Spurious Emission	16
APPENDIX 2: Test Instruments.....	38
APPENDIX 3: Photographs of Test Setup.....	39
Radiated Spurious Emission	39
Worst Case Position.....	40
Test Configuration and peripherals.....	41

SECTION 1: Customer Information

Company Name	Sony Interactive Entertainment Inc.
Brand Name	SONY
Address	1-7-1 Konan, Minato-ku, Tokyo, 108-0075 Japan
Telephone Number	+81-50-3807-5639
Contact Person	Miho Nakamura

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 communication module
Model Number	AW-XM501
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	December 13, 2022
Test Date	January 16 to 24, 2023

2.2 Product Description

General Specification

Rating	DC 3.3 V, DC 1.8 V
--------	--------------------

Radio Specification

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

Equipment Type	Transceiver	
Frequency of Operation	2412 MHz to 2462 MHz	
Type of Modulation	DSSS, OFDM	
	OFDMA (IEEE802.11ax only)	20 MHz: 26/52/106/242-tone RU
Bandwidth & Channel spacing	Less than 20 MHz & 5 MHz	
Method of frequency generation	Synthesizer	
Antenna Type	PIFA	
Antenna Gain: G_{ANT}	Antenna 1: 4.0 dBi Antenna 2: 4.5 dBi	
Directional Gain *1)	7.26 dBi	
Maximum clock frequency	320 MHz	

WLAN (IEEE802.11a/11n-20/11ac-20/11ax-20/11n-40/11ac-40/11ax-40/11ac-80/11ax-80)

Equipment Type	Transceiver	
Frequency of Operation	20 M Band: 5180 MHz to 5240 MHz 5260 MHz to 5320 MHz 5500 MHz to 5720 MHz 5745 MHz to 5825 MHz	
	40 M Band: 5190 MHz to 5230 MHz 5270 MHz to 5310 MHz 5510 MHz to 5710 MHz 5755 MHz to 5795 MHz	
	80 M Band: 5210 MHz 5290 MHz 5530 MHz to 5690 MHz 5775 MHz	
Type of Modulation	OFDM	
	OFDMA (IEEE802.11ax only)	20 MHz: 26/52/106/242-tone RU 40 MHz: 26/52/106/242/484-tone RU 80 MHz: 26/52/106/242/484/996-tone RU
Bandwidth & Channel spacing	Less than 20 MHz / 40 MHz / 80 MHz & 20 MHz / 40 MHz / 80 MHz	
Method of frequency generation	Synthesizer	
Antenna Type	PIFA	IFA
Antenna Gain: G_{ANT}	Antenna 1: 6.4 dBi	Antenna 3: 5.0 dBi
Directional Gain *1)	8.74 dBi	
Maximum clock frequency	512 MHz	

BT1: Bluetooth (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK) BT LE: GFSK
Bandwidth / Channel spacing	BT:79 MHz / 1 MHz BT LE: 1 MHz & 2 MHz / 2 MHz
Method of frequency generation	Synthesizer
Antenna Type	IFA
Antenna Gain	Antenna 3: 3.0 dBi
Maximum clock frequency	128 MHz

BT2: Bluetooth (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK) BT LE: GFSK
Bandwidth / Channel spacing	BT:79 MHz / 1 MHz BT LE: 1 MHz & 2 MHz / 2 MHz
Method of frequency generation	Synthesizer
Antenna Type	IFA
Antenna Gain	Antenna 4: 4.5 dBi
Maximum clock frequency	128 MHz

*1) Directional antenna gain = $10 \log \left(\frac{G_{ANT1}}{(10^{20} + 10^{20})^2 / 2} \right)$

*This test report applies to Bluetooth (Low Energy) part.

2.3 Contents of modification

Each antenna was changed from original application.

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

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02	FCC: Section15.247(d)	3.2 dB 878.2 MHz, Horizontal / Vertical, QP	Complied a)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			
Note: UL Japan, Inc.'s EMI Work Procedures: 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) 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 Radiated Spurious Emission)					

FCC Part 15.31 (e)

The stable voltage will be supplied by the end product, which will be required to have a power supply regulator.
Therefore, the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

[Antenna 1 and 2] The EUT has unique coupling/antenna connector (U.FL).

[Antenna 3 and 4] The antenna is not removable from the EUT.

Therefore, the equipment complies with the antenna requirement of Section 15.203/212.

3.3 Addition to Standard

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 $k = 2$.

Radiated emission

Measurement distance	Frequency range		Uncertainty (+/-)
3 m	9 kHz to 30 MHz		3.3 dB
10 m			3.1 dB
3 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	5.0 dB
	200 MHz to 1000 MHz	Horizontal	5.1 dB
		Vertical	6.2 dB
10 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	4.8 dB
	200 MHz to 1000 MHz	Horizontal	4.9 dB
		Vertical	5.0 dB
3 m	1 GHz to 6 GHz		4.9 dB
	6 GHz to 18 GHz		5.2 dB
1 m	10 GHz to 26.5 GHz		5.5 dB
	26.5 GHz to 40 GHz		5.4 dB
10 m	1 GHz to 18 GHz		5.3 dB

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

ISED Lab Company Number: 2973C / CAB identifier: JP0002

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan

Telephone: +81-596-24-8999

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.10 shielded room	3.8 x 2.8 x 2.8	3.8 x 2.8	-	-
No.11 measurement room	4.0 x 3.4 x 2.5	N/A	-	-
No.12 measurement room	2.6 x 3.4 x 2.5	N/A	-	-
Large Chamber	16.9 x 22.1 x 10.17	16.9 x 22.1	-	10 m
Small Chamber	5.3 x 6.69 x 3.59	5.3 x 6.69	-	-

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)

[BT LE]

Mode	Remarks*
Bluetooth Low Energy (BT LE) 1M-PHY Uncoded PHY (1M-PHY)	Maximum Packet Size, PRBS9
Bluetooth Low Energy (BT LE) 2M-PHY Uncoded PHY (2M-PHY)	Maximum Packet Size, PRBS9
*Power of the EUT was set by the software as follows; Power Setting: 2.0 dBm Software: Dut Labtool, Version: 1.0.0.111 (Date: December 13, 2022, 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 Antenna	Tested frequency
Radiated Spurious Emission (Below 1 GHz)	Tx BT LE, 1M-PHY *1)	Antenna 3 (BT1) Antenna 4 (BT2)	2402 MHz
Radiated Spurious Emission (Above 1 GHz)	Tx BT LE, 1M-PHY Tx BT LE, 2M-PHY	Antenna 3 (BT1) Antenna 4 (BT2)	2402 MHz 2440 MHz 2480 MHz
*1) 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.			

Simultaneous transmission (Only Antenna 3 simultaneously transmits BT1 and WLAN 5 GHz band on a single antenna.)

Test Item	Mode *1)	Antenna type
Radiated Spurious Emission	Tx BT LE 2440 MHz 2M-PHY + Tx 11ax-20 (OFDM) 5700 MHz	Antenna 3 (BT1)
*1) The test was conducted on representative mode, the worst mode of GHz band at Spurious emission test for BT1 and the mode had the highest power at Antenna terminal conducted test for WLAN 5 GHz band.		

4.2 Configuration and Peripherals

This page has been submitted for a separate exhibit.

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

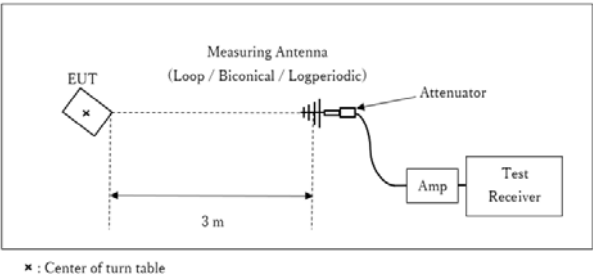
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired 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	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	<u>11.12.2.5.1</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces <u>11.12.2.5.2</u> The duty cycle was less than 98% for detected noise, a duty factor was added to the 11.12.2.5.1 results.	RBW: 100 kHz VBW: 300 kHz

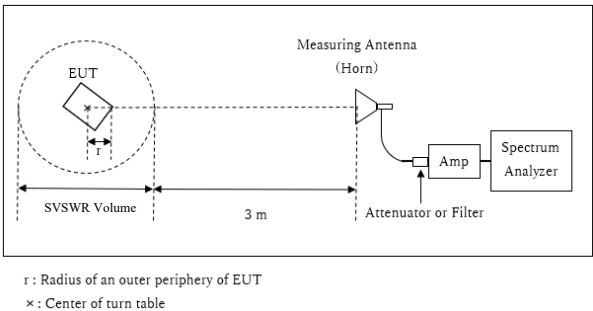
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz to 10 GHz

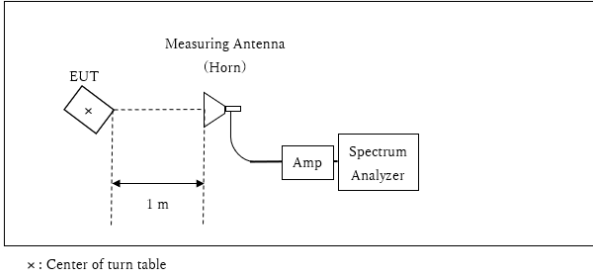


Distance Factor: $20 \times \log (3.75 \text{ m} / 3.0 \text{ m}) = 1.94 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.75 \text{ m}$

SVSWR Volume : 1.5 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.0 \text{ m}$

* The test was performed with $r = 0.0 \text{ m}$ since EUT is small and it was the rather conservative condition.

10 GHz to 26.5 GHz



Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$
*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.

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

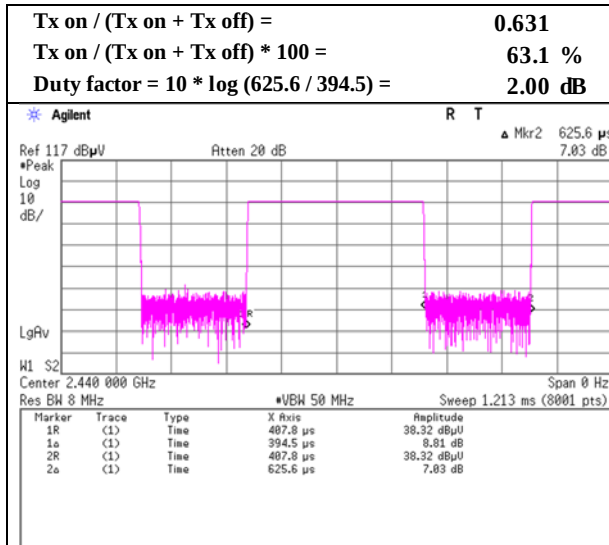
APPENDIX 1: Test Data

Burst rate confirmation

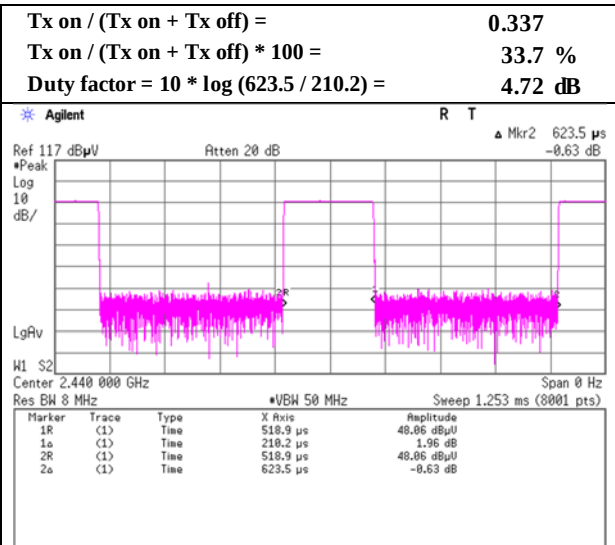
Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Date	January 16, 2023
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Kiyoshiro Okazaki
Mode	Tx

BT1

BT LE 1M-PHY

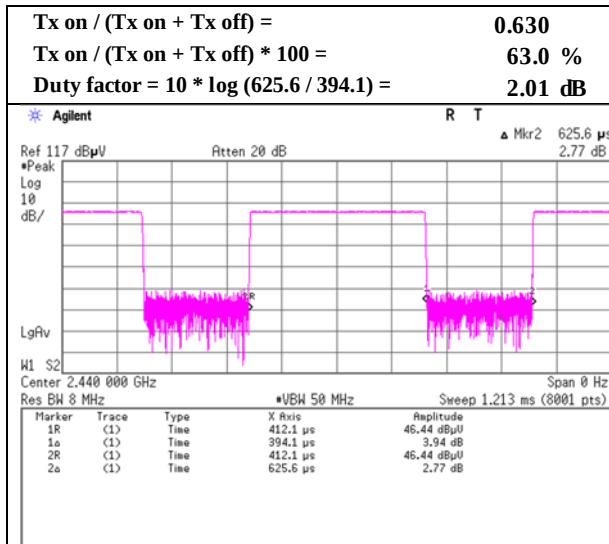


BT LE 2M-PHY

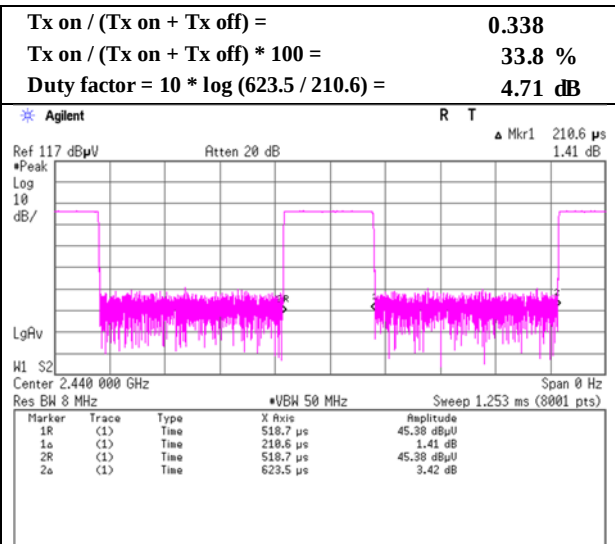


BT2

BT LE 1M-PHY



BT LE 2M-PHY



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

Radiated Spurious Emission
(BT1)

Test place Ise EMC Lab.
Semi Anechoic Chamber No.2 No.2 No.2 No.2
Date January 17, 2023 January 22, 2023 January 23, 2023 January 24, 2023
Temperature / Humidity 22 deg. C / 43 % RH 20 deg. C / 45 % RH 18 deg. C / 41 % RH 19 deg. C / 39 % RH
Engineer Kiyoshiro Okazaki Hiroki Numata Takumi Nishida Takumi Nishida
 (1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx BT LE 2402 MHz 1M-PHY

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	57.6	36.4	-	8.7	7.0	28.5	-	23.5	-	40.0	-	16.5	-	
Hori.	119.7	42.4	-	12.9	7.5	28.4	-	34.4	-	43.5	-	9.1	-	
Hori.	146.4	39.4	-	14.8	7.7	28.3	-	33.6	-	43.5	-	9.9	-	
Hori.	335.8	36.8	-	15.2	8.9	28.0	-	33.0	-	46.0	-	13.1	-	
Hori.	368.4	40.6	-	15.3	9.1	28.2	-	36.7	-	46.0	-	9.3	-	
Hori.	547.9	31.9	-	18.0	10.0	29.2	-	30.7	-	46.0	-	15.4	-	
Hori.	639.1	37.3	-	19.4	10.3	29.3	-	37.7	-	46.0	-	8.3	-	
Hori.	680.3	38.7	-	19.7	10.5	29.3	-	39.6	-	46.0	-	6.5	-	
Hori.	878.2	38.5	-	22.1	11.1	28.9	-	42.8	-	46.0	-	3.2	-	
Hori.	2342.7	50.2	40.6	27.8	5.1	34.9	2.0	48.2	40.6	73.9	53.9	25.7	13.3	*2)
Hori.	2390.0	46.2	35.8	27.6	5.1	34.9	2.0	44.1	35.6	73.9	53.9	29.8	18.3	*1)
Hori.	4804.0	43.2	34.6	31.6	7.4	34.1	-	48.2	39.5	73.9	53.9	25.8	14.4	Floor noise
Hori.	7206.0	43.6	35.3	35.9	8.7	34.1	-	54.0	45.7	73.9	53.9	19.9	8.2	Floor noise
Hori.	9608.0	45.2	33.7	38.8	9.5	34.7	-	58.8	47.3	73.9	53.9	15.1	6.6	Floor noise
Vert.	57.6	47.6	-	8.7	7.0	28.5	-	34.7	-	40.0	-	5.3	-	
Vert.	119.7	41.4	-	12.9	7.5	28.4	-	33.5	-	43.5	-	10.0	-	
Vert.	146.4	39.7	-	14.8	7.7	28.3	-	33.9	-	43.5	-	9.6	-	
Vert.	335.8	42.8	-	15.2	8.9	28.0	-	39.0	-	46.0	-	7.0	-	
Vert.	368.4	46.5	-	15.3	9.1	28.2	-	42.7	-	46.0	-	3.4	-	
Vert.	547.9	40.6	-	18.0	10.0	29.2	-	39.3	-	46.0	-	6.7	-	
Vert.	639.1	34.8	-	19.4	10.3	29.3	-	35.2	-	46.0	-	10.8	-	
Vert.	680.3	37.1	-	19.7	10.5	29.3	-	38.0	-	46.0	-	8.0	-	
Vert.	878.2	38.5	-	22.1	11.1	28.9	-	42.8	-	46.0	-	3.2	-	
Vert.	2342.7	46.9	38.1	27.8	5.1	34.9	2.0	44.9	38.1	73.9	53.9	29.0	15.8	*2)
Vert.	2390.0	44.7	35.4	27.6	5.1	34.9	2.0	42.6	35.3	73.9	53.9	31.3	18.6	*1)
Vert.	4804.0	43.1	34.2	31.6	7.4	34.1	-	48.1	39.2	73.9	53.9	25.8	14.8	Floor noise
Vert.	7206.0	43.3	35.0	35.9	8.7	34.1	-	53.8	45.4	73.9	53.9	20.1	8.5	Floor noise
Vert.	9608.0	45.3	33.5	38.8	9.5	34.7	-	58.9	47.2	73.9	53.9	15.0	6.7	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

*2) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2402.0	100.6	27.6	5.2	34.9	98.4	-	-	Carrier
Hori.	2400.0	43.7	27.6	5.2	34.9	41.5	78.4	36.9	
Vert.	2402.0	97.4	27.6	5.2	34.9	95.2	-	-	Carrier
Vert.	2400.0	40.0	27.6	5.2	34.9	37.8	75.2	37.4	

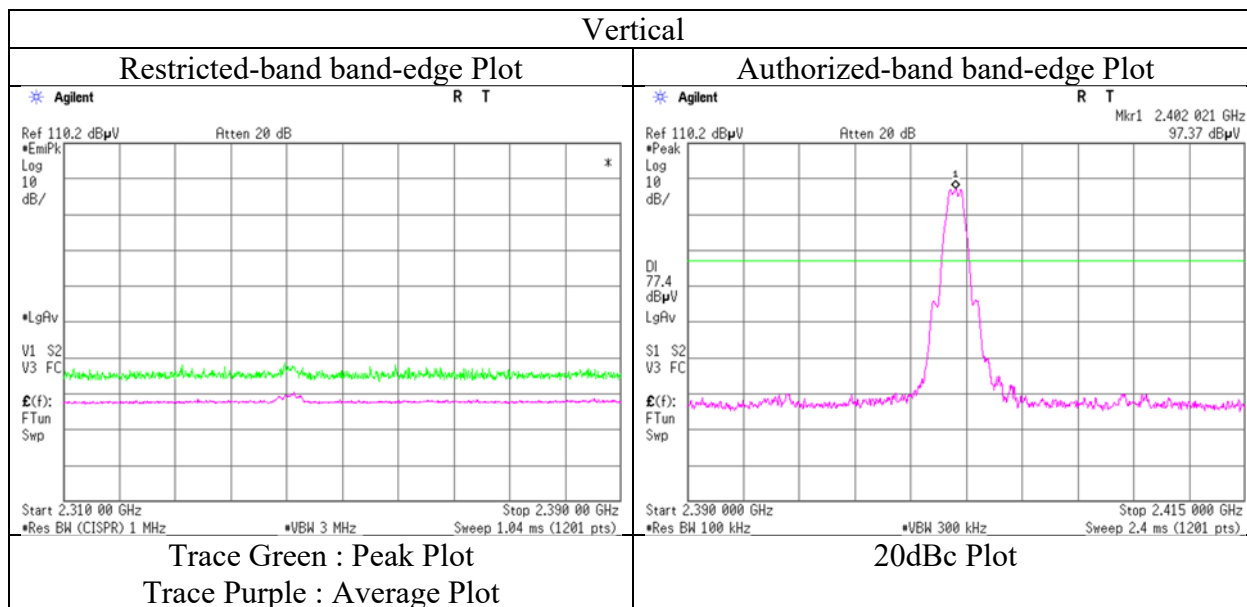
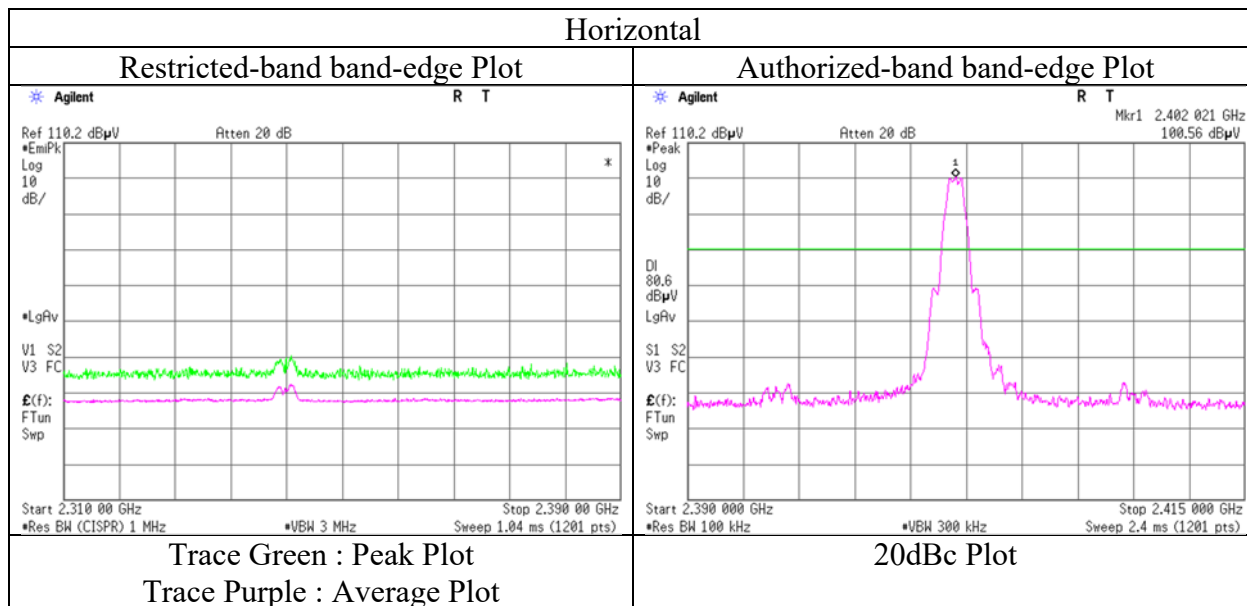
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission **(Reference Plot for band-edge)** **(BT1)**

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 17, 2023
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Kiyoshiro Okazaki
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz 1M-PHY



* 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 (BT1)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2440 MHz 1M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2375.7	50.3	40.3	27.7	5.1	34.9	2.0	48.2	40.2	73.9	53.9	25.8	13.7	*1)
Hori.	4880.0	42.4	34.1	31.7	7.4	34.1	-	47.4	39.1	73.9	53.9	26.5	14.8	Floor noise
Hori.	7320.0	43.1	34.4	36.1	8.7	34.1	-	53.7	45.0	73.9	53.9	20.2	8.9	Floor noise
Hori.	9760.0	45.1	33.3	39.2	9.6	34.7	-	59.2	47.3	73.9	53.9	14.7	6.6	Floor noise
Vert.	2375.7	48.3	39.3	27.7	5.1	34.9	2.0	46.2	39.2	73.9	53.9	27.7	14.8	*1)
Vert.	4880.0	42.7	34.6	31.7	7.4	34.1	-	47.8	39.6	73.9	53.9	26.2	14.3	Floor noise
Vert.	7320.0	43.2	34.7	36.1	8.7	34.1	-	53.8	45.3	73.9	53.9	20.1	8.6	Floor noise
Vert.	9760.0	45.2	33.2	39.2	9.6	34.7	-	59.3	47.3	73.9	53.9	14.6	6.6	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2440.0	97.1	27.5	5.2	34.9	94.9	-	-	Carrier
Hori.	2504.3	46.2	27.5	5.2	34.9	44.0	74.9	30.8	
Vert.	2440.0	97.5	27.5	5.2	34.9	95.3	-	-	Carrier
Vert.	2504.3	44.0	27.5	5.2	34.9	41.8	75.3	33.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log(3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (BT1)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz 1M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2483.5	46.5	36.3	27.5	5.2	34.9	2.0	44.3	36.1	73.9	53.9	29.6	17.8	*1)
Hori.	2487.7	46.7	37.2	27.5	5.2	34.9	2.0	44.5	37.0	73.9	53.9	29.4	16.9	*2)
Hori.	4960.0	43.0	34.3	31.8	7.5	34.1	-	48.2	39.4	73.9	53.9	25.7	14.5	Floor noise
Hori.	7440.0	43.2	34.0	36.2	8.7	34.2	-	54.0	44.7	73.9	53.9	19.9	9.2	Floor noise
Hori.	9920.0	45.2	33.1	39.2	9.6	34.7	-	59.3	47.1	73.9	53.9	14.6	6.8	Floor noise
Vert.	2483.5	46.3	36.6	27.5	5.2	34.9	2.0	44.2	36.4	73.9	53.9	29.8	17.5	*1)
Vert.	2487.7	47.7	37.5	27.5	5.2	34.9	2.0	45.5	37.3	73.9	53.9	28.4	16.6	*2)
Vert.	4960.0	43.1	34.5	31.8	7.5	34.1	-	48.3	39.7	73.9	53.9	25.7	14.2	Floor noise
Vert.	7440.0	43.3	34.0	36.2	8.7	34.2	-	54.0	44.7	73.9	53.9	19.9	9.2	Floor noise
Vert.	9920.0	45.2	33.1	39.2	9.6	34.7	-	59.3	47.2	73.9	53.9	14.6	6.7	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

*2) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2480.0	96.5	27.5	5.2	34.9	94.3	-	-	Carrier
Hori.	2551.0	44.4	27.5	5.3	34.8	42.3	74.3	32.0	
Vert.	2480.0	97.3	27.5	5.2	34.9	95.1	-	-	Carrier
Vert.	2551.0	43.2	27.5	5.3	34.8	41.2	75.1	33.9	

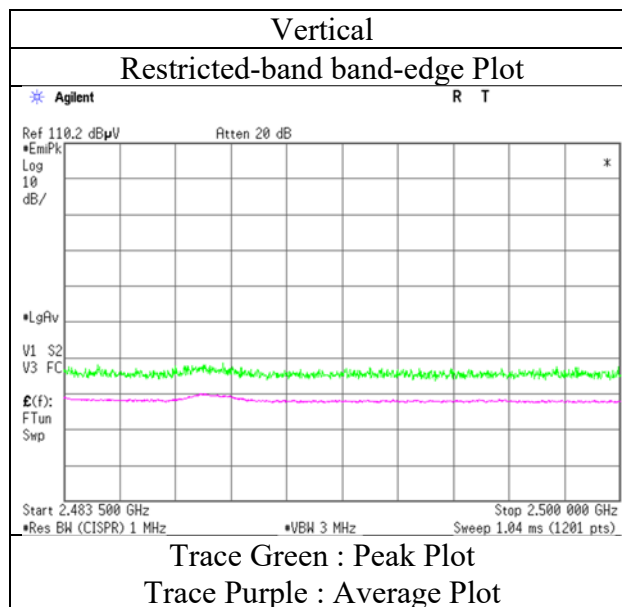
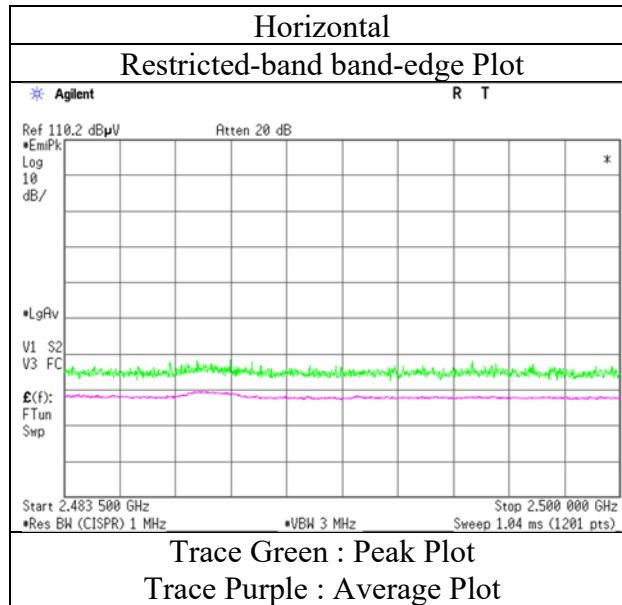
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$

10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)
(BT1)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 17, 2023
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Kiyoshiro Okazaki
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz 1M-PHY



* 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 (BT1)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2402 MHz 2M-PHY		

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2337.9	52.6	41.2	27.8	5.1	34.9	4.7	50.6	43.9	73.9	53.9	23.3	10.0	*2)
Hori.	2390.0	53.6	37.5	27.6	5.1	34.9	4.7	51.4	40.1	73.9	53.9	22.5	13.8	*1)
Hori.	4804.0	43.3	34.2	31.6	7.4	34.1	-	48.2	39.1	73.9	53.9	25.7	14.8	Floor noise
Hori.	7206.0	43.0	34.0	35.9	8.7	34.1	-	53.5	44.5	73.9	53.9	20.5	9.4	Floor noise
Hori.	9608.0	45.4	33.1	38.8	9.5	34.7	-	59.0	46.8	73.9	53.9	14.9	7.1	Floor noise
Vert.	2337.9	50.6	39.2	27.8	5.1	34.9	4.7	48.6	41.9	73.9	53.9	25.3	12.0	*2)
Vert.	2390.0	50.8	36.7	27.6	5.1	34.9	4.7	48.7	39.3	73.9	53.9	25.2	14.6	*1)
Vert.	4804.0	43.2	34.2	31.6	7.4	34.1	-	48.2	39.1	73.9	53.9	25.8	14.8	Floor noise
Vert.	7206.0	43.4	34.0	35.9	8.7	34.1	-	53.9	44.4	73.9	53.9	20.0	9.5	Floor noise
Vert.	9608.0	45.3	33.2	38.8	9.5	34.7	-	58.9	46.8	73.9	53.9	15.0	7.1	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

*2) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2402.0	99.8	27.6	5.2	34.9	97.6	-	-	Carrier
Hori.	2400.0	67.7	27.6	5.2	34.9	65.6	77.6	12.1	
Vert.	2402.0	98.6	27.6	5.2	34.9	96.4	-	-	Carrier
Vert.	2400.0	66.4	27.6	5.2	34.9	64.2	76.4	12.2	

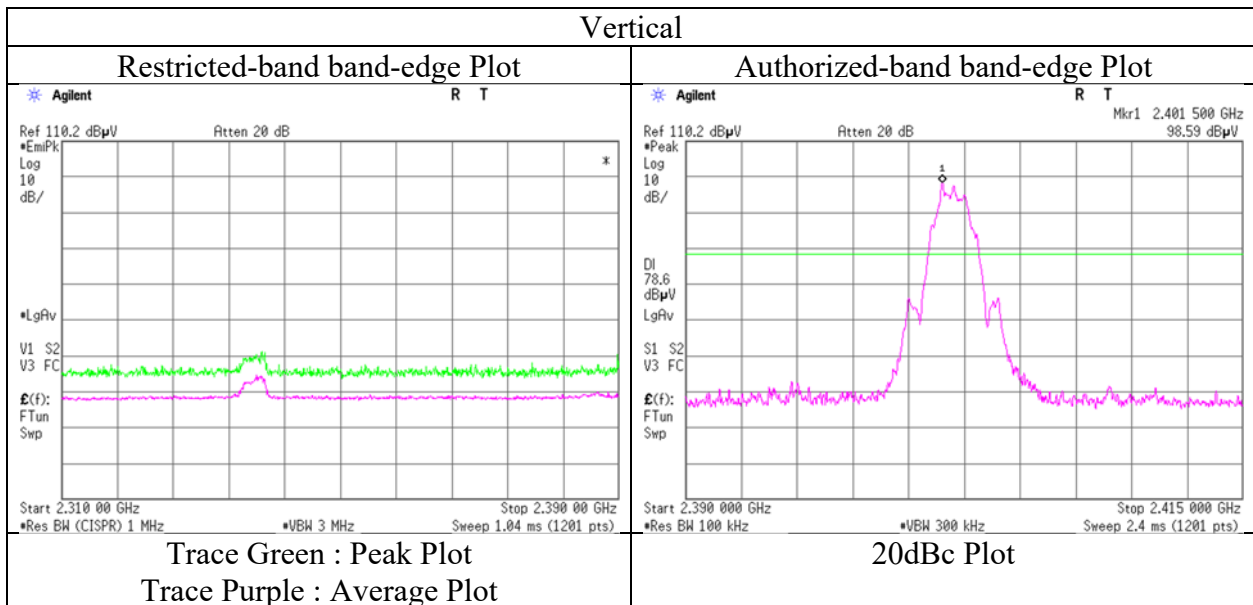
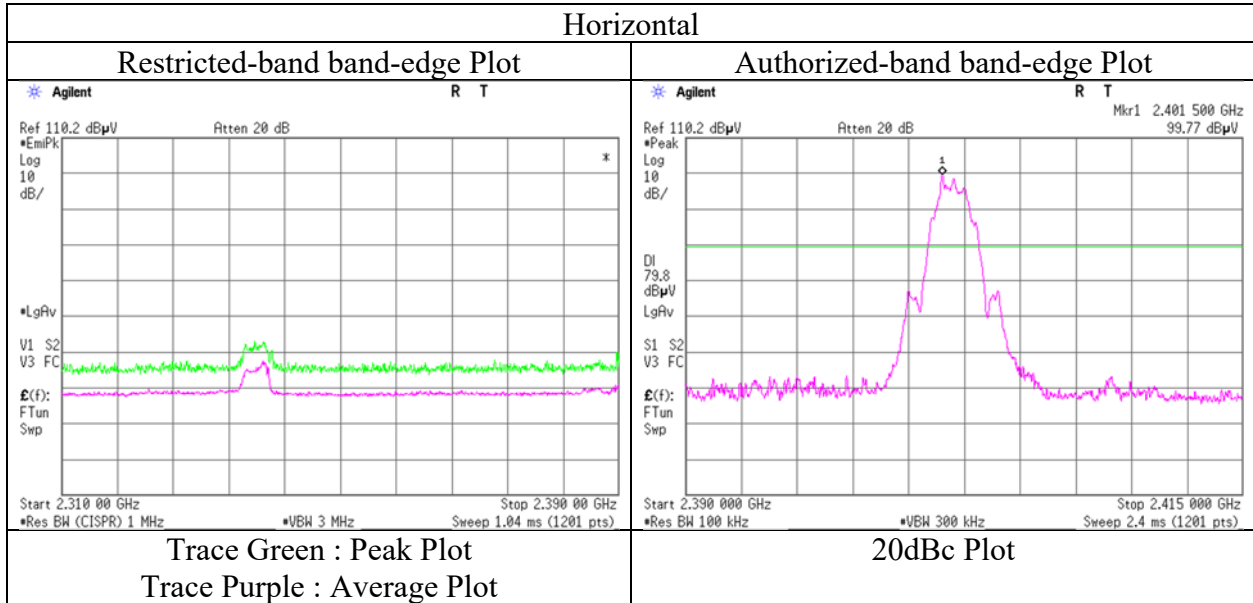
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$

10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)
(BT1)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 17, 2023
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Kiyoshiro Okazaki
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz 2M-PHY



* 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 (BT1)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2440 MHz 2M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2371.6	52.5	40.1	27.7	5.1	34.9	4.7	50.4	42.7	73.9	53.9	23.5	11.2	*1)
Hori.	4880.0	43.2	34.5	31.7	7.4	34.1	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Hori.	7320.0	43.2	34.0	36.1	8.7	34.1	-	53.8	44.6	73.9	53.9	20.1	9.3	Floor noise
Hori.	9760.0	45.1	33.2	39.2	9.6	34.7	-	59.2	47.3	73.9	53.9	14.7	6.6	Floor noise
Vert.	2371.6	53.7	42.3	27.7	5.1	34.9	4.7	51.6	45.0	73.9	53.9	22.4	9.0	*1)
Vert.	4880.0	43.2	34.2	31.7	7.4	34.1	-	48.2	39.2	73.9	53.9	25.7	14.7	Floor noise
Vert.	7320.0	43.5	34.0	36.1	8.7	34.1	-	54.1	44.6	73.9	53.9	19.8	9.3	Floor noise
Vert.	9760.0	45.2	33.2	39.2	9.6	34.7	-	59.3	47.2	73.9	53.9	14.6	6.7	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2440.0	97.7	27.5	5.2	34.9	95.5	-	-	Carrier
Hori.	2506.4	49.6	27.5	5.2	34.9	47.5	75.5	28.0	
Vert.	2440.0	98.0	27.5	5.2	34.9	95.8	-	-	Carrier
Vert.	2506.4	48.5	27.5	5.2	34.9	46.3	75.8	29.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log(3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (BT1)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz 2M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2483.5	58.5	42.2	27.5	5.2	34.9	4.7	56.3	44.7	73.9	53.9	17.6	9.2	*1)
Hori.	4960.0	43.2	34.3	31.8	7.5	34.1	-	48.3	39.5	73.9	53.9	25.6	14.5	Floor noise
Hori.	7440.0	43.3	34.0	36.2	8.7	34.2	-	54.0	44.7	73.9	53.9	19.9	9.2	Floor noise
Hori.	9920.0	45.3	33.1	39.2	9.6	34.7	-	59.4	47.2	73.9	53.9	14.5	6.7	Floor noise
Vert.	2483.5	56.0	40.3	27.5	5.2	34.9	4.7	53.8	42.8	73.9	53.9	20.1	11.1	*1)
Vert.	4960.0	43.2	34.2	31.8	7.5	34.1	-	48.4	39.3	73.9	53.9	25.5	14.6	Floor noise
Vert.	7440.0	43.5	34.2	36.2	8.7	34.2	-	54.2	45.0	73.9	53.9	19.7	8.9	Floor noise
Vert.	9920.0	45.2	33.2	39.2	9.6	34.7	-	59.2	47.2	73.9	53.9	14.7	6.7	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2480.0	98.5	27.5	5.2	34.9	96.3	-	-	Carrier
Hori.	2551.0	51.3	27.5	5.3	34.8	49.2	76.3	27.1	
Vert.	2480.0	95.7	27.5	5.2	34.9	93.5	-	-	Carrier
Vert.	2551.0	48.3	27.5	5.3	34.8	46.2	73.5	27.2	

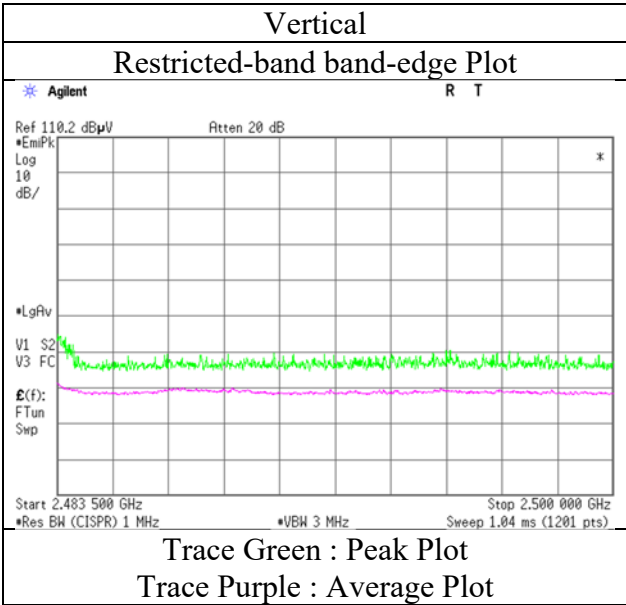
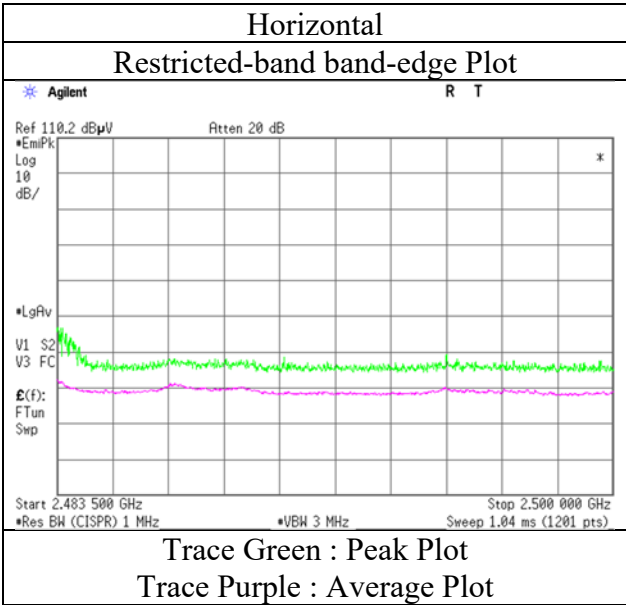
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log(3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge
(BT1)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 17, 2023
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Kiyoshiro Okazaki
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz 2M-PHY



* 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
(BT2)

Test place Ise EMC Lab.
Semi Anechoic Chamber No.2 No.2 No.2 No.2
Date January 17, 2023 January 22, 2023 January 23, 2023 January 24, 2023
Temperature / Humidity 22 deg. C / 43 % RH 20 deg. C / 45 % RH 18 deg. C / 41 % RH 19 deg. C / 39 % RH
Engineer Kiyoshiro Okazaki Hiroki Numata Takumi Nishida Takumi Nishida
 (1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx BT LE 2402 MHz 1M-PHY

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	57.7	36.2	-	8.6	7.0	28.5	-	23.3	-	40.0	-	16.7	-	
Hori.	119.6	42.2	-	12.9	7.5	28.4	-	34.3	-	43.5	-	9.2	-	
Hori.	146.3	39.6	-	14.8	7.7	28.3	-	33.8	-	43.5	-	9.8	-	
Hori.	335.7	36.6	-	15.2	8.9	28.0	-	32.7	-	46.0	-	13.3	-	
Hori.	368.2	40.4	-	15.3	9.1	28.2	-	36.6	-	46.0	-	9.5	-	
Hori.	547.9	31.7	-	18.0	10.0	29.2	-	30.4	-	46.0	-	15.6	-	
Hori.	639.2	37.5	-	19.4	10.3	29.3	-	37.9	-	46.0	-	8.1	-	
Hori.	680.1	38.8	-	19.7	10.5	29.3	-	39.7	-	46.0	-	6.3	-	
Hori.	878.3	38.4	-	22.1	11.1	28.9	-	42.8	-	46.0	-	3.3	-	
Hori.	2341.1	50.4	42.7	27.8	5.1	34.9	2.0	48.4	42.7	73.9	53.9	25.5	11.2	*2)
Hori.	2390.0	45.3	35.7	27.6	5.1	34.9	2.0	43.2	35.5	73.9	53.9	30.8	18.4	*1)
Hori.	4804.0	43.2	34.1	31.6	7.4	34.1	-	48.1	39.1	73.9	53.9	25.8	14.8	Floor noise
Hori.	7206.0	43.3	34.2	35.9	8.7	34.1	-	53.7	44.7	73.9	53.9	20.2	9.3	Floor noise
Hori.	9608.0	45.2	33.1	38.8	9.5	34.7	-	58.8	46.7	73.9	53.9	15.1	7.2	Floor noise
Vert.	57.7	47.9	-	8.6	7.0	28.5	-	35.0	-	40.0	-	5.0	-	
Vert.	119.6	41.6	-	12.9	7.5	28.4	-	33.6	-	43.5	-	9.9	-	
Vert.	146.3	39.7	-	14.8	7.7	28.3	-	33.9	-	43.5	-	9.6	-	
Vert.	335.7	43.0	-	15.2	8.9	28.0	-	39.2	-	46.0	-	6.9	-	
Vert.	368.2	46.5	-	15.3	9.1	28.2	-	42.6	-	46.0	-	3.4	-	
Vert.	547.9	40.9	-	18.0	10.0	29.2	-	39.6	-	46.0	-	6.4	-	
Vert.	639.2	34.9	-	19.4	10.3	29.3	-	35.4	-	46.0	-	10.7	-	
Vert.	680.1	37.4	-	19.7	10.5	29.3	-	38.3	-	46.0	-	7.8	-	
Vert.	878.3	38.4	-	22.1	11.1	28.9	-	42.7	-	46.0	-	3.3	-	
Vert.	2341.1	51.7	41.3	27.8	5.1	34.9	2.0	49.7	41.3	73.9	53.9	24.2	12.6	*2)
Vert.	2390.0	50.4	36.2	27.6	5.1	34.9	2.0	48.2	36.1	73.9	53.9	25.7	17.8	*1)
Vert.	4804.0	43.3	34.0	31.6	7.4	34.1	-	48.2	39.0	73.9	53.9	25.7	15.0	Floor noise
Vert.	7206.0	43.0	34.1	35.9	8.7	34.1	-	53.5	44.6	73.9	53.9	20.4	9.3	Floor noise
Vert.	9608.0	45.3	33.2	38.8	9.5	34.7	-	59.0	46.8	73.9	53.9	15.0	7.1	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

*2) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2402.0	100.5	27.6	5.2	34.9	98.3	-	-	Carrier
Hori.	2400.0	43.3	27.6	5.2	34.9	41.2	78.3	37.2	
Vert.	2402.0	100.6	27.6	5.2	34.9	98.5	-	-	Carrier
Vert.	2400.0	43.1	27.6	5.2	34.9	40.9	78.5	37.6	

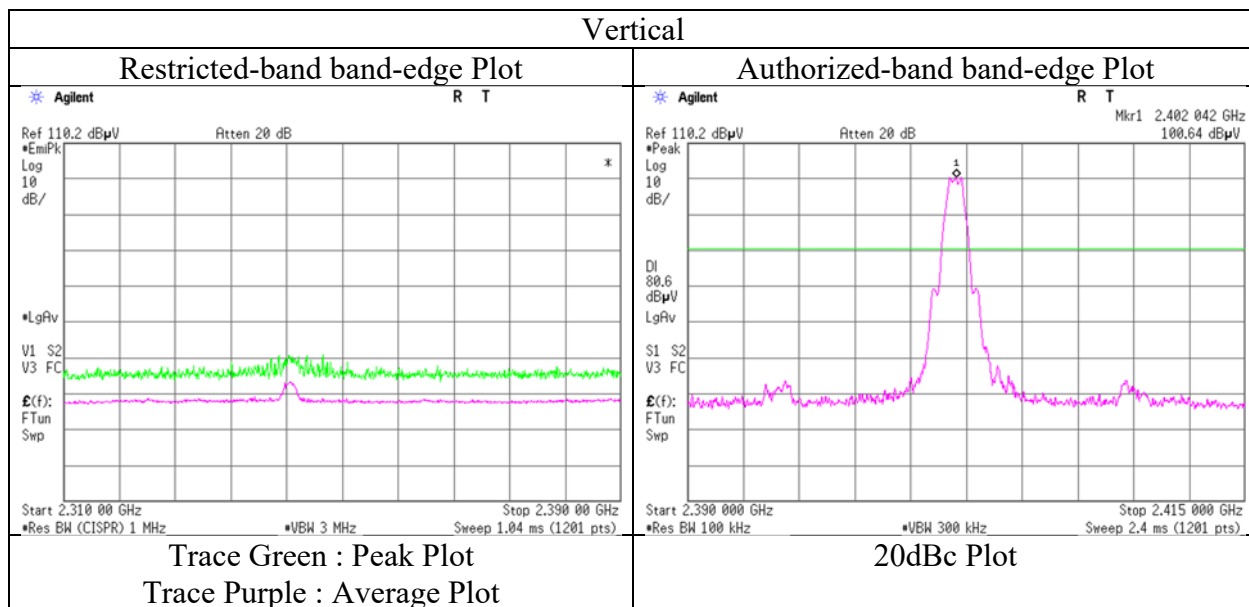
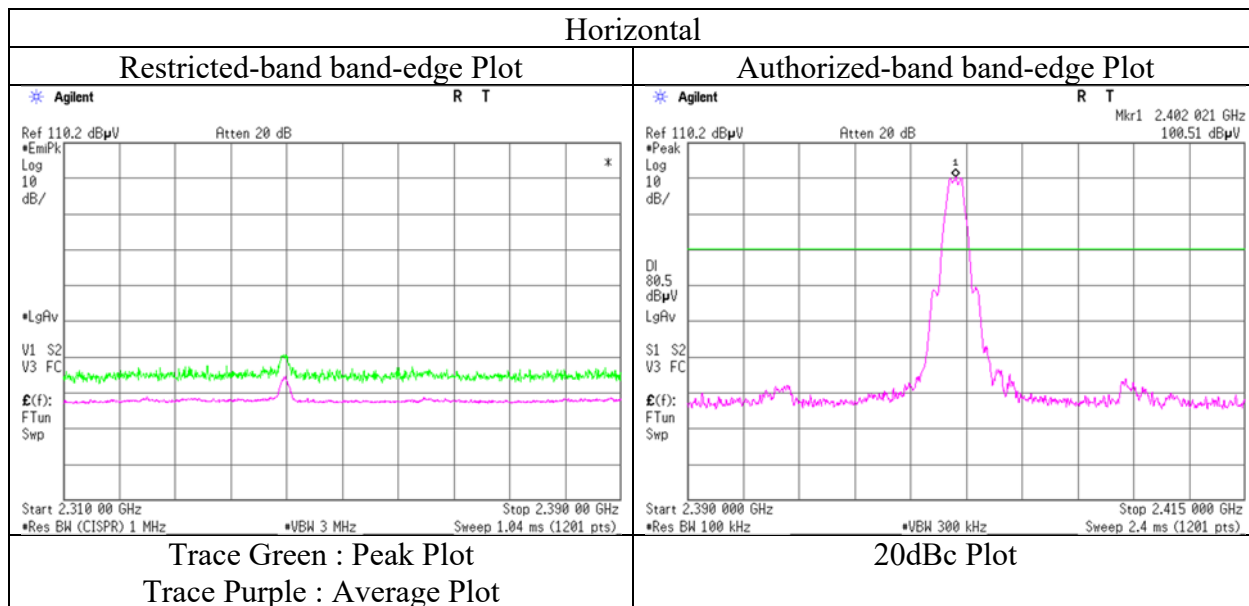
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log(3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission **(Reference Plot for band-edge)** **(BT2)**

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 17, 2023
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Kiyoshiro Okazaki
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz 1M-PHY



* 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 (BT2)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2440 MHz 1M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2374.2	51.6	43.0	27.7	5.1	34.9	2.0	49.5	42.9	73.9	53.9	24.4	11.0	*1)
Hori.	4880.0	43.1	34.2	31.7	7.4	34.1	-	48.1	39.2	73.9	53.9	25.8	14.7	Floor noise
Hori.	7320.0	43.2	34.2	36.1	8.7	34.1	-	53.8	44.8	73.9	53.9	20.1	9.1	Floor noise
Hori.	9760.0	45.5	33.0	39.2	9.6	34.7	-	59.6	47.1	73.9	53.9	14.3	6.8	Floor noise
Vert.	2374.2	52.7	42.1	27.7	5.1	34.9	2.0	50.6	42.0	73.9	53.9	23.4	11.9	*1)
Vert.	4880.0	43.2	34.2	31.7	7.4	34.1	-	48.3	39.2	73.9	53.9	25.7	14.7	Floor noise
Vert.	7320.0	43.1	34.3	36.1	8.7	34.1	-	53.7	44.9	73.9	53.9	20.2	9.0	Floor noise
Vert.	9760.0	45.4	33.1	39.2	9.6	34.7	-	59.5	47.1	73.9	53.9	14.4	6.8	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2440.0	101.0	27.5	5.2	34.9	98.8	-	-	Carrier
Hori.	2506.0	47.0	27.5	5.2	34.9	44.8	78.8	34.0	
Vert.	2440.0	100.5	27.5	5.2	34.9	98.2	-	-	Carrier
Vert.	2506.0	45.0	27.5	5.2	34.9	42.8	78.2	35.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (BT2)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz 1M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2483.5	52.3	38.4	27.5	5.2	34.9	2.0	50.1	38.2	73.9	53.9	23.8	15.7	*1)
Hori.	2487.6	50.1	41.8	27.5	5.2	34.9	2.0	48.0	41.6	73.9	53.9	26.0	12.3	*2)
Hori.	4960.0	43.3	34.2	31.8	7.5	34.1	-	48.4	39.3	73.9	53.9	25.5	14.6	Floor noise
Hori.	7440.0	43.3	34.1	36.2	8.7	34.2	-	54.1	44.9	73.9	53.9	19.8	9.1	Floor noise
Hori.	9920.0	45.0	33.1	39.2	9.6	34.7	-	59.1	47.1	73.9	53.9	14.8	6.8	Floor noise
Vert.	2483.5	51.8	38.3	27.5	5.2	34.9	2.0	49.6	38.1	73.9	53.9	24.3	15.8	*1)
Vert.	2487.6	51.6	40.8	27.5	5.2	34.9	2.0	49.4	40.6	73.9	53.9	24.5	13.3	*2)
Vert.	4960.0	43.2	34.2	31.8	7.5	34.1	-	48.3	39.4	73.9	53.9	25.6	14.5	Floor noise
Vert.	7440.0	43.2	34.1	36.2	8.7	34.2	-	54.0	44.9	73.9	53.9	19.9	9.0	Floor noise
Vert.	9920.0	45.3	33.0	39.2	9.6	34.7	-	59.4	47.1	73.9	53.9	14.5	6.8	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

*2) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2480.0	100.9	27.5	5.2	34.9	98.7	-	-	Carrier
Hori.	2548.0	45.8	27.5	5.3	34.8	43.7	78.7	35.0	
Vert.	2480.0	99.8	27.5	5.2	34.9	97.6	-	-	Carrier
Vert.	2548.0	44.1	27.5	5.3	34.8	42.1	77.6	35.5	

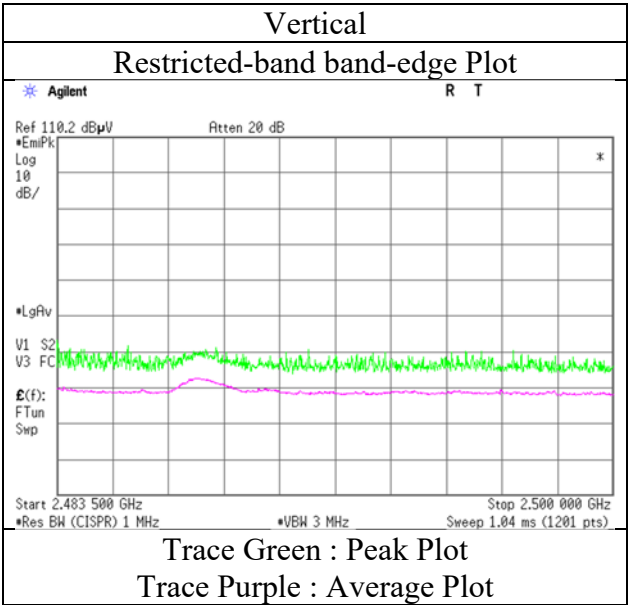
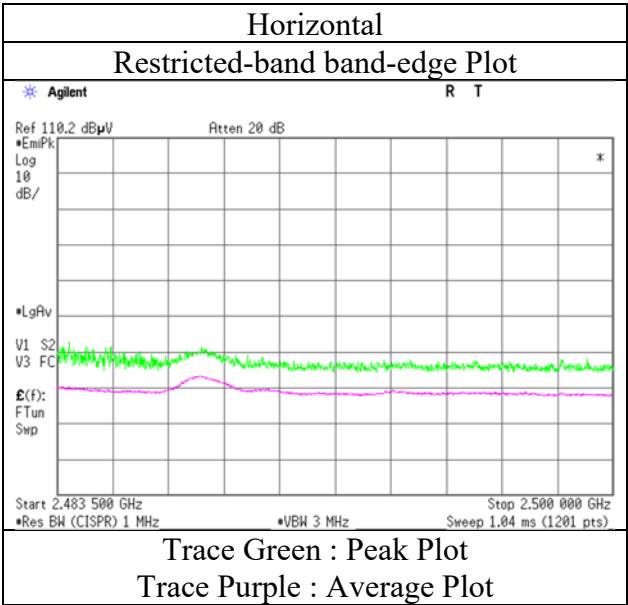
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)
(BT2)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 17, 2023
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Kiyoshiro Okazaki
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz 1M-PHY



* 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 (BT2)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 18, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	20 deg. C / 52 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Hiroki Numata	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2402 MHz 2M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2337.8	56.0	45.1	27.8	5.1	34.9	4.7	54.1	47.9	73.9	53.9	19.9	6.0	*2)
Hori.	2390.0	49.6	36.9	27.6	5.1	34.9	4.7	47.4	39.5	73.9	53.9	26.5	14.4	*1)
Hori.	4804.0	43.2	34.3	31.6	7.4	34.1	-	48.2	39.3	73.9	53.9	25.7	14.7	Floor noise
Hori.	7206.0	43.1	34.0	35.9	8.7	34.1	-	53.6	44.4	73.9	53.9	20.3	9.5	Floor noise
Hori.	9608.0	45.3	33.1	38.8	9.5	34.7	-	58.9	46.7	73.9	53.9	15.0	7.2	Floor noise
Vert.	2337.8	54.6	44.7	27.8	5.1	34.9	4.7	52.6	47.5	73.9	53.9	21.3	6.5	*2)
Vert.	2390.0	48.3	36.1	27.6	5.1	34.9	4.7	46.1	38.7	73.9	53.9	27.8	15.2	*1)
Vert.	4804.0	43.1	34.2	31.6	7.4	34.1	-	48.0	39.2	73.9	53.9	25.9	14.8	Floor noise
Vert.	7206.0	43.4	34.0	35.9	8.7	34.1	-	53.9	44.5	73.9	53.9	20.0	9.4	Floor noise
Vert.	9608.0	45.2	33.1	38.8	9.5	34.7	-	58.8	46.7	73.9	53.9	15.1	7.2	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

*2) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2402.0	101.8	27.6	5.2	34.9	99.6	-	-	Carrier
Hori.	2400.0	69.7	27.6	5.2	34.9	67.5	79.6	12.1	
Vert.	2402.0	99.8	27.6	5.2	34.9	97.6	-	-	Carrier
Vert.	2400.0	67.7	27.6	5.2	34.9	65.5	77.6	12.2	

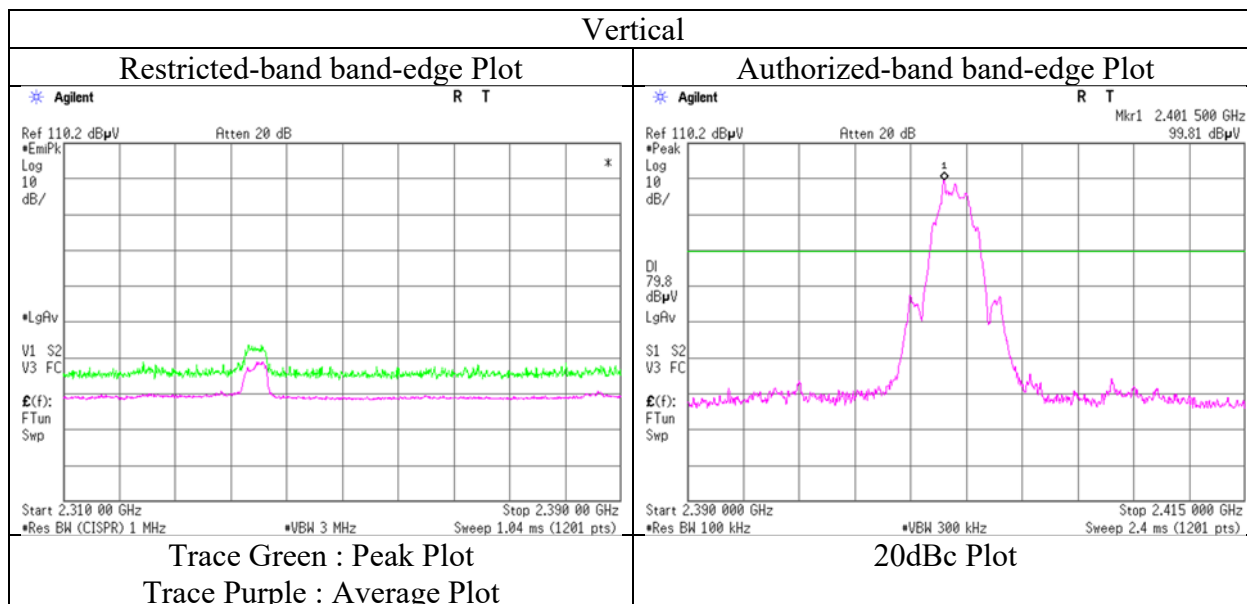
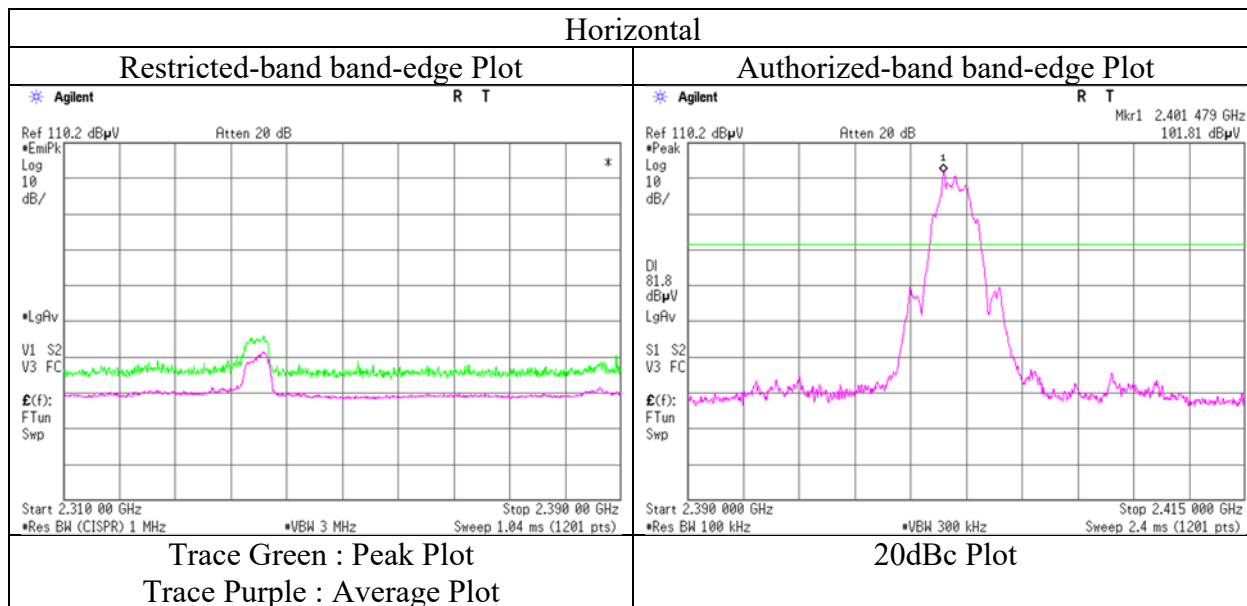
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log(3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission **(Reference Plot for band-edge)** **(BT2)**

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 18, 2023
Temperature / Humidity	20 deg. C / 52 % RH
Engineer	Hiroki Numata
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz 2M-PHY



* 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 (BT2)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 18, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	20 deg. C / 52 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Hiroki Numata	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2440 MHz 2M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2371.0	55.9	45.1	27.7	5.1	34.9	4.7	53.8	47.8	73.9	53.9	20.1	6.1	*1)
Hori.	4880.0	43.2	34.3	31.7	7.4	34.1	-	48.2	39.3	73.9	53.9	25.7	14.6	Floor noise
Hori.	7320.0	43.2	34.0	36.1	8.7	34.1	-	53.8	44.6	73.9	53.9	20.1	9.3	Floor noise
Hori.	9760.0	45.2	33.2	39.2	9.6	34.7	-	59.3	47.2	73.9	53.9	14.6	6.7	Floor noise
Vert.	2371.0	54.5	43.2	27.7	5.1	34.9	4.7	52.5	45.8	73.9	53.9	21.5	8.1	*1)
Vert.	4880.0	43.2	34.4	31.7	7.4	34.1	-	48.2	39.4	73.9	53.9	25.7	14.5	Floor noise
Vert.	7320.0	43.5	34.0	36.1	8.7	34.1	-	54.1	44.6	73.9	53.9	19.8	9.3	Floor noise
Vert.	9760.0	45.2	33.1	39.2	9.6	34.7	-	59.3	47.2	73.9	53.9	14.7	6.7	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Noise synchronized with duty of carrier frequency

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2440.0	101.9	27.5	5.2	34.9	99.7	-	-	Carrier
Hori.	2509.1	50.3	27.5	5.2	34.9	48.2	79.7	31.5	
Vert.	2440.0	100.0	27.5	5.2	34.9	97.7	-	-	Carrier
Vert.	2509.1	52.8	27.5	5.2	34.9	50.6	77.7	27.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log(3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (BT2)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	January 18, 2023	January 22, 2023	January 23, 2023
Temperature / Humidity	20 deg. C / 52 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH
Engineer	Hiroki Numata	Hiroki Numata	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz 2M-PHY		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2483.5	60.6	43.0	27.5	5.2	34.9	4.7	58.4	45.6	73.9	53.9	15.5	8.4	*1)
Hori.	4960.0	43.1	34.3	31.8	7.5	34.1	-	48.2	39.4	73.9	53.9	25.7	14.5	Floor noise
Hori.	7440.0	43.3	34.0	36.2	8.7	34.2	-	54.0	44.8	73.9	53.9	19.9	9.1	Floor noise
Hori.	9920.0	45.3	33.2	39.2	9.6	34.7	-	59.3	47.2	73.9	53.9	14.6	6.7	Floor noise
Vert.	2483.5	59.2	41.4	27.5	5.2	34.9	4.7	57.0	43.9	73.9	53.9	16.9	10.0	*1)
Vert.	4960.0	43.8	34.0	31.8	7.5	34.1	-	48.9	39.2	73.9	53.9	25.0	14.7	Floor noise
Vert.	7440.0	43.4	34.2	36.2	8.7	34.2	-	54.2	45.0	73.9	53.9	19.7	9.0	Floor noise
Vert.	9920.0	45.1	33.2	39.2	9.6	34.7	-	59.2	47.2	73.9	53.9	14.7	6.7	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2480.0	100.9	27.5	5.2	34.9	98.7	-	-	Carrier
Hori.	2553.2	47.8	27.5	5.3	34.8	45.8	78.7	33.0	
Vert.	2480.0	99.6	27.5	5.2	34.9	97.4	-	-	Carrier
Vert.	2553.2	50.4	27.5	5.3	34.8	48.3	77.4	29.1	

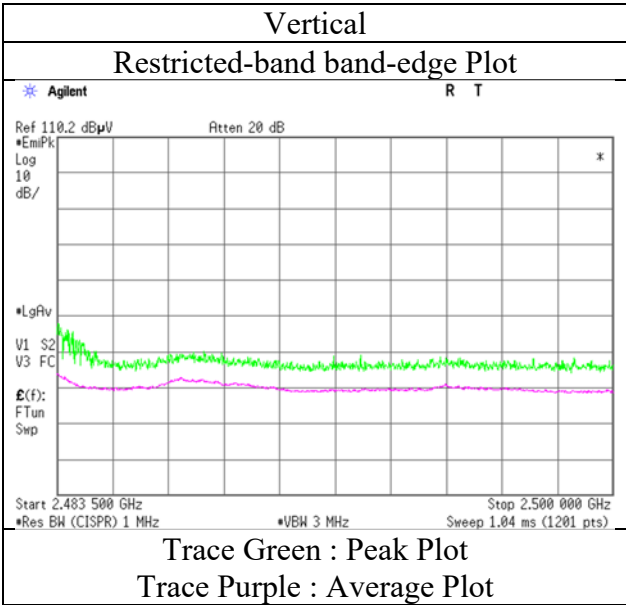
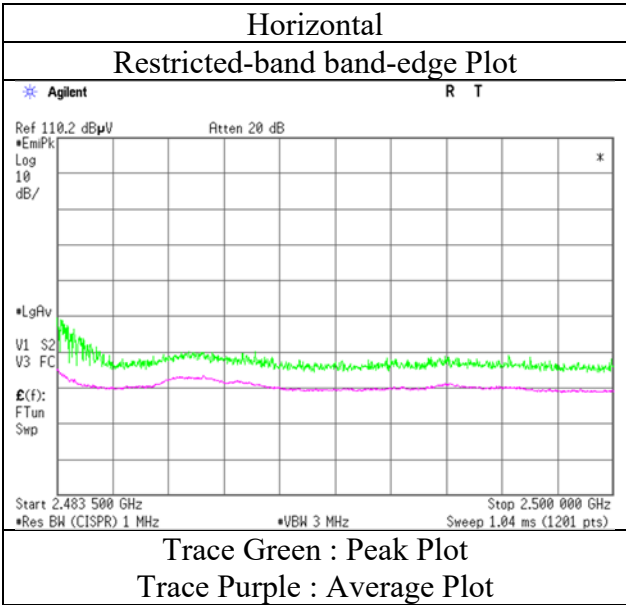
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log(3.75 m / 3.0 m) = 1.94 dB

10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)
(BT2)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	January 18, 2023
Temperature / Humidity	20 deg. C / 52 % RH
Engineer	Hiroki Numata
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz 2M-PHY



* 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.

Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.2	No.2	No.2	No.2
Date	January 22, 2023	January 22, 2023	January 23, 2023	January 24, 2023
Temperature / Humidity	20 deg. C / 45 % RH	18 deg. C / 40 % RH	18 deg. C / 41 % RH	19 deg. C / 39 % RH
Engineer	Hiroki Numata	Yuichiro Yamazaki	Takumi Nishida	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx BT LE 2440 MHz 2M-PHY + 11ax-20 (OFDM) 5700 MHz			

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	57.5	36.4	-	8.7	7.0	28.5	-	23.6	-	40.0	-	16.4	-	
Hori.	119.7	42.2	-	12.9	7.5	28.4	-	34.3	-	43.5	-	9.2	-	
Hori.	146.4	39.4	-	14.8	7.7	28.3	-	33.6	-	43.5	-	9.9	-	
Hori.	335.8	36.8	-	15.3	8.9	28.0	-	32.9	-	46.0	-	13.1	-	
Hori.	368.2	40.6	-	15.3	9.1	28.2	-	36.8	-	46.0	-	9.3	-	
Hori.	548.0	31.4	-	18.0	10.0	29.2	-	30.1	-	46.0	-	15.9	-	
Hori.	639.2	37.6	-	19.4	10.3	29.3	-	38.0	-	46.0	-	8.0	-	
Hori.	680.2	38.6	-	19.7	10.5	29.3	-	39.5	-	46.0	-	6.5	-	
Hori.	878.4	38.7	-	22.1	11.1	28.9	-	43.0	-	46.0	-	3.0	-	
Hori.	2372.0	53.0	41.9	27.7	5.1	34.9	4.7	50.9	44.5	73.9	53.9	23.1	9.4	*1)
Hori.	4880.0	42.5	34.8	31.7	7.4	34.1	-	47.5	39.8	73.9	53.9	26.4	14.1	Floor noise
Hori.	7320.0	42.4	34.0	36.1	8.7	34.1	-	53.0	44.6	73.9	53.9	20.9	9.3	Floor noise
Hori.	9760.0	45.2	32.5	39.2	9.6	34.7	-	59.3	46.5	73.9	53.9	14.6	7.4	Floor noise
Vert.	57.5	47.6	-	8.7	7.0	28.5	-	34.8	-	40.0	-	5.2	-	
Vert.	119.7	41.4	-	12.9	7.5	28.4	-	33.5	-	43.5	-	10.0	-	
Vert.	146.4	39.7	-	14.8	7.7	28.3	-	33.9	-	43.5	-	9.6	-	
Vert.	335.8	42.8	-	15.3	8.9	28.0	-	39.0	-	46.0	-	7.0	-	
Vert.	368.2	46.6	-	15.3	9.1	28.2	-	42.8	-	46.0	-	3.3	-	
Vert.	548.0	40.8	-	18.0	10.0	29.2	-	39.6	-	46.0	-	6.5	-	
Vert.	639.2	34.7	-	19.4	10.3	29.3	-	35.1	-	46.0	-	10.9	-	
Vert.	680.2	37.7	-	19.7	10.5	29.3	-	38.6	-	46.0	-	7.4	-	
Vert.	878.4	38.4	-	22.1	11.1	28.9	-	42.7	-	46.0	-	3.3	-	
Vert.	2372.0	52.9	42.2	27.7	5.1	34.9	4.7	50.8	44.8	73.9	53.9	23.1	9.1	*1)
Vert.	4880.0	42.9	33.9	31.7	7.4	34.1	-	47.9	39.0	73.9	53.9	26.0	15.0	Floor noise
Vert.	7320.0	42.4	34.2	36.1	8.7	34.1	-	53.0	44.8	73.9	53.9	20.9	9.1	Floor noise
Vert.	9760.0	45.3	32.5	39.2	9.6	34.7	-	59.4	46.6	73.9	53.9	14.5	7.3	Floor noise

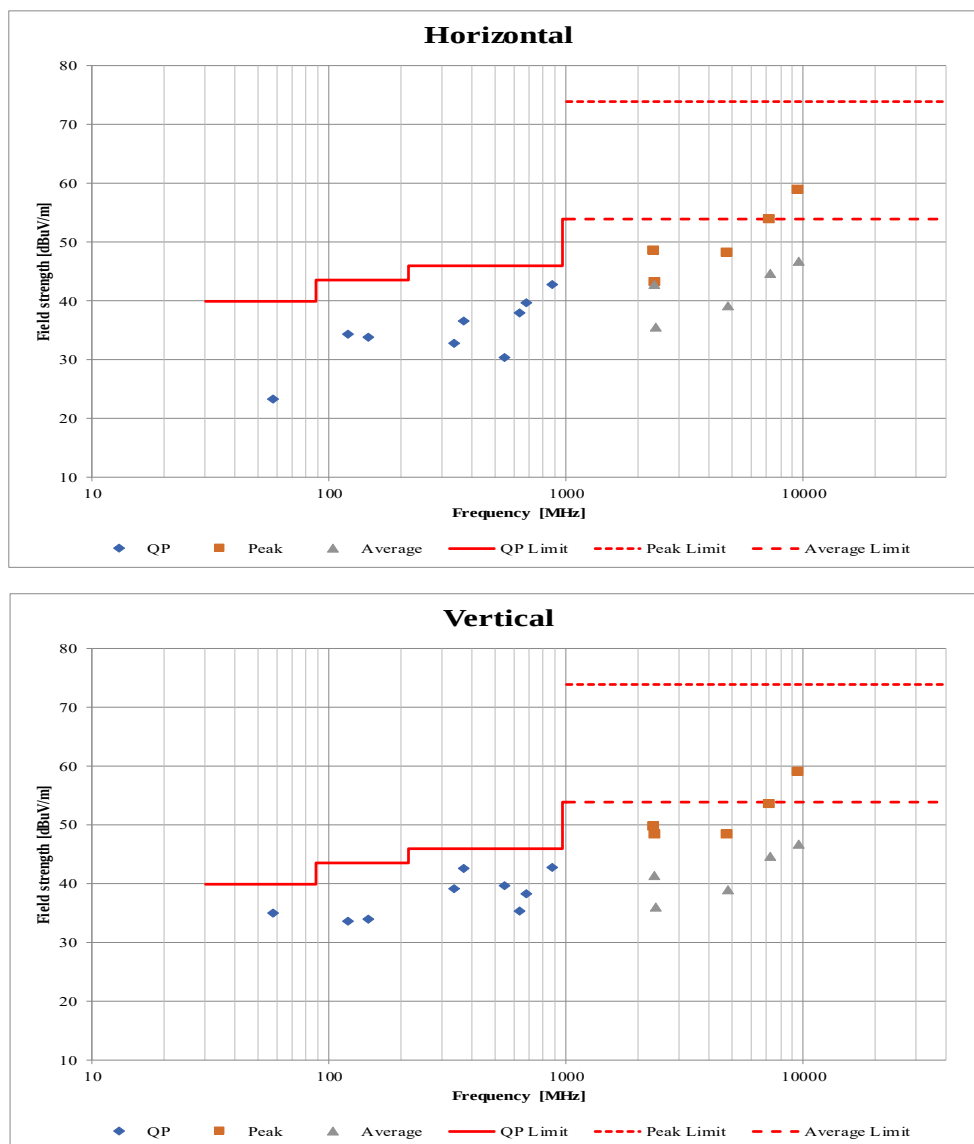
*1) Noise synchronized with duty of carrier frequency

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2440.0	98.3	27.5	5.2	34.9	96.1	-	-	Carrier
Hori.	2507.6	46.8	27.5	5.2	34.9	44.6	76.1	31.5	
Vert.	2440.0	96.3	27.5	5.2	34.9	94.1	-	-	Carrier
Vert.	2507.6	48.7	27.5	5.2	34.9	46.5	74.1	27.6	

$$10 \text{ GHz} - 26.5 \text{ GHz} \quad 20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$$

Radiated Spurious Emission
(Plot data, Worst case mode for Maximum Peak Output Power)
(BT2)

Test place	Ise EMC Lab.	No.2	No.2	No.2
Semi Anechoic Chamber	No.2	No.2	No.2	No.2
Date	January 17, 2023	January 22, 2023	January 23, 2023	January 24, 2023
Temperature / Humidity	22 deg. C / 43 % RH	20 deg. C / 45 % RH	18 deg. C / 41 % RH	19 deg. C / 39 % RH
Engineer	Kiyoshiro Okazaki	Hiroki Numata	Takumi Nishida	Takumi Nishida
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx BT LE 2402 MHz 1M-PHY			



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

APPENDIX 2: Test Instruments

Test Equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/30/2022	24
RE	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/09/2021	24
RE	MAT-112	220646	Attenuator	Huber+Suhner	6806_N-50-1	-	06/07/2022	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B+ BBA9106	08031	07/30/2022	12
RE	MCC-12	141317	Coaxial Cable	UL Japan	-	-	09/27/2022	12
RE	MCC-176	141279	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S303	03/15/2022	12
RE	MCC-218	141394	Microwave Cable	Junkosha	MWX221	1607S141(1 m) / 1608S264(5 m)	09/12/2022	12
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	254	10/20/2022	12
RE	MHA-16	141513	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170306	07/05/2022	12
RE	MHF-16	141406	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCA	7001	09/07/2022	12
RE	MHF-26	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/08/2022	12
RE	MJM-27	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	MLA-21	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-190	07/30/2022	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/12/2022	12
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/17/2022	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/22/2022	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/25/2022	12
RE	MSA-04	141885	Spectrum Analyzer	Keysight Technologies Inc	E4448A	US44300523	11/21/2022	12
RE	MTR-03	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	07/29/2022	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