RADIO TEST REPORT

Test Report No. 14597255S-G

Customer	**NTT Sonority Inc.**
Description of EUT	**wireless on-ear speakers**
Model Number of EUT	**MBE001**
FCC ID	**2A58O-MBE001**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**January 20, 2023**
Remarks	**Bluetooth (BR / EDR) part(s)**

Representative Test Engineer	Approved By
M. Ikudome	T. Imamura
Miku Ikudome Engineer	Toyokazu Imamura Leader

CERTIFICATE 1266.03

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☒ There is no testing item of "Non-accreditation".

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- The information provided from the customer for this report is identified in Section 1.
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REVISION HISTORY

Original Test Report No.: 14597255S-G

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14597255S-G	January 20, 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

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SECTION 1: Customer Information

Company Name	NTT Sonority Inc.
Address	1-5-1 Otemachi, Chiyoda-ku, Tokyo 100-8116, Japan
Telephone Number	+81-80-8231-5126
Contact Person	Akira Nakagawa

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 on-ear speakers
Model Number	MBE001
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 1, 2022
Test Date	December 2 to 20, 2022

2.2 Product Description

General Specification

Rating	Typical: DC 3.85 V (3.0 V to 4.4 V)
Operating temperature	-10 deg. C to +50 deg. C

Radio Specification

Bluetooth (BR / EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, π/4 DQPSK, 8 DPSK)
Antenna Gain	Left: -1.8 dBi, Right: -1.6 dBi

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	GFSK
Antenna Gain	Left: -1.8 dBi, Right: -1.6 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	**FCC:** Section 15.207	-	N/A	*1)
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
Carrier Frequency Separation	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)	See data.	Complied a)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (b)			
20dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)		Complied a)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Dwell time	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied c)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(b)(1)		Complied d)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	9.9 dB 7206.000 MHz, AV, Horizontal Mode: Tx DH5 2402 MHz EUT: Right	Complied e) / f)	Conducted/ Radiated (above 30 MHz) *2)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures: 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 is not applicable since the EUT has no AC mains. Bluetooth does not operate during charging.
*2) Radiated test was selected over 30 MHz based on section 15.247(d).

a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)
b) Refer to APPENDIX 1 (data of Number of Hopping Frequency)
c) Refer to APPENDIX 1 (data of Dwell time)
d) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) 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 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					

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	0.92 %

3.5 Test Location

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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 (BT)	BR / EDR, Payload: PRBS9

*EUT has the power settings by the software as follows;
Power Setting: 7
Software: Version: 0.8.2
(Date: 2022.11 21, Storage location: EUT memory)

*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.
*Antenna Terminal Conducted test was performed with a sample of Right side as a representative. This is because the antenna gain on the right side is higher, and there is no difference in the RF part between the right and left sides.

Details of Operating Mode(s)

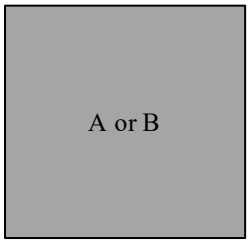
Test Item	Mode	Hopping	Tested Frequency
Radiated Spurious Emission (Below 1 GHz)	Tx 3DH5 *1)	Off	2480 MHz
Radiated Spurious Emission (Above 1 GHz), Conducted Spurious Emission	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx DH5 Tx 3DH5	On	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx DH5 Tx 3DH5	On	-
Dwell time	Tx DH1, DH3, DH5 Tx 3DH1, 3DH3, 3DH5	On	-
Maximum Peak Output Power	Tx DH5 Tx 2DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5 Tx 3DH5	On Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5 Tx 3DH5	On Off	2402 MHz 2441 MHz 2480 MHz

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
*It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.

*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

<Radiated Emission test>

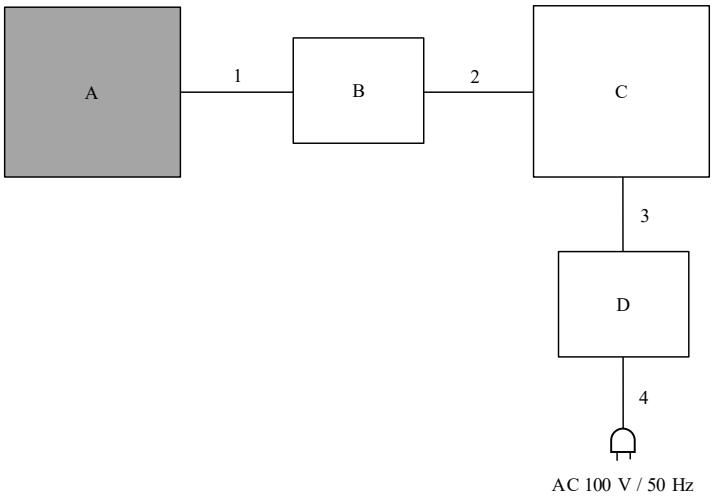


* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	wireless on-ear speakers	MBE001	B2242025B02	Foster Electric	EUT (Left)
B	wireless on-ear speakers	MBE001	B2242023B02	Foster Electric	EUT (Right)

<Antenna Terminal conducted test>



Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	wireless on-ear speakers	MBE001	B2242004802	Foster Electric	EUT (Right)
B	HIGH SPEED DEBUG ADAPTOR	TRBI200	N178553	QUALCOMM	-
C	Laptop PC	ProBook 5220m	CNF038C2C6	hp	-
D	AC Adapter	HSTNN-DA14	WAWQL0AARZE35R	hp	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	0.02+0.1+0.3	Unshielded	Unshielded	-
2	USB	1.8	Shielded	Shielded	-
3	DC	1.1	Unshielded	Unshielded	-
4	AC	1.8	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a platform of nominal size, 1.0 m by 2.0 m or 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. *1)
The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.
*1) Test for EUT (Left): 1.0 m by 2.0 m, EUT (Right): 1.0 m by 1.5 m

[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.

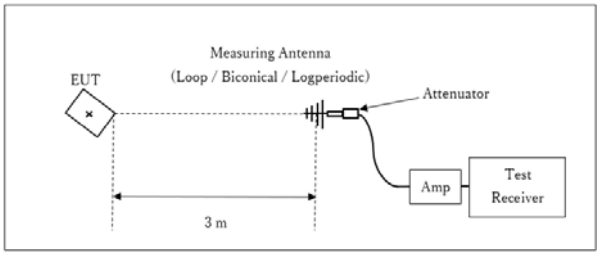
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *2)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak	RBW: 100 kHz VBW: 300 kHz

*2) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r02.

Figure 1: Test Setup

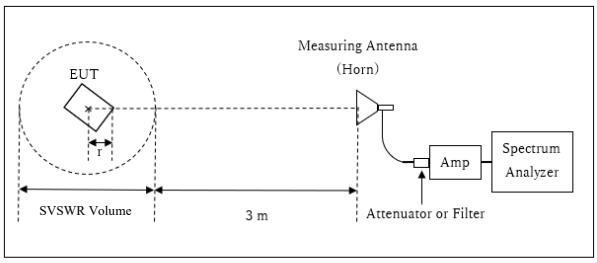
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

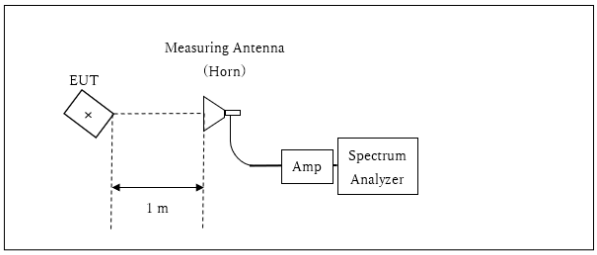


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.98 m / 3.0 m) = 2.46 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 0.02 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.02 m

10 GHz to 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 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.

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument Used
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to disp 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: 160MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	200 kHz	620 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) 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)
*4) 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 Ohmes. 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

20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off, Tx, Hopping On

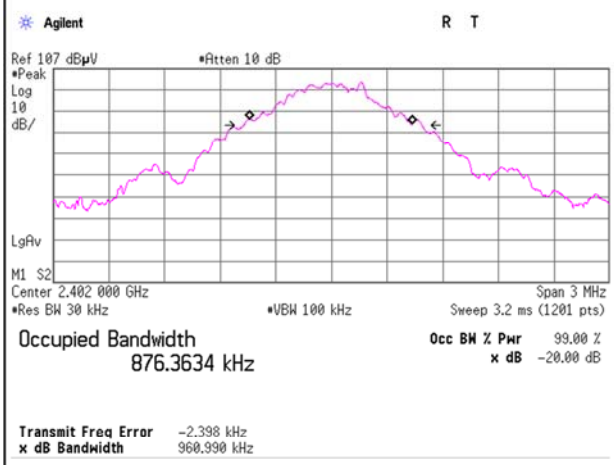
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.961	876.4	1.000	>= 0.641
DH5	2441.0	0.961	869.6	1.000	>= 0.641
DH5	2480.0	0.961	872.5	1.000	>= 0.641
DH5	Hopping On	-	78646.2	-	-
3DH5	2402.0	1.309	1186.3	1.000	>= 0.873
3DH5	2441.0	1.339	1194.4	1.000	>= 0.893
3DH5	2480.0	1.313	1187.4	1.000	>= 0.875
3DH5	Hopping On	-	78768.1	-	-

Limit: Two-thirds of 20 dB Bandwidth or 25 kHz (whichever is greater).
No limit applies to 20 dB Bandwidth.

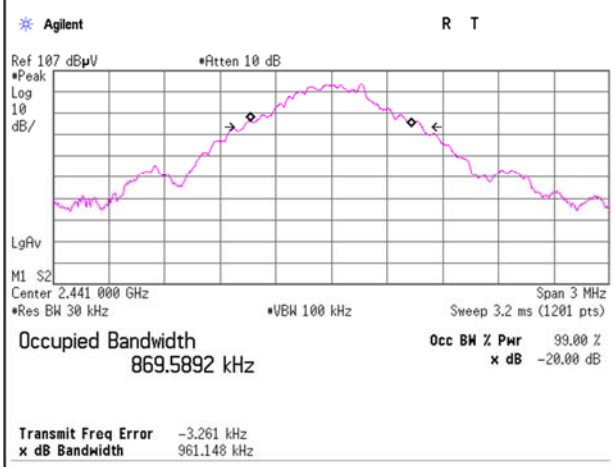
20 dB Bandwidth & 99 % Occupied Bandwidth

DH5

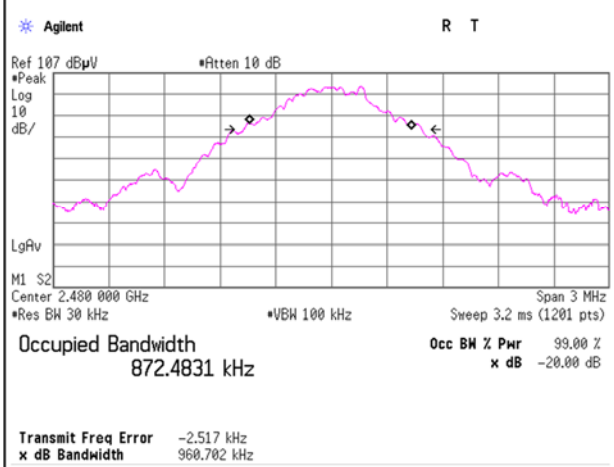
2402 MHz



2441 MHz

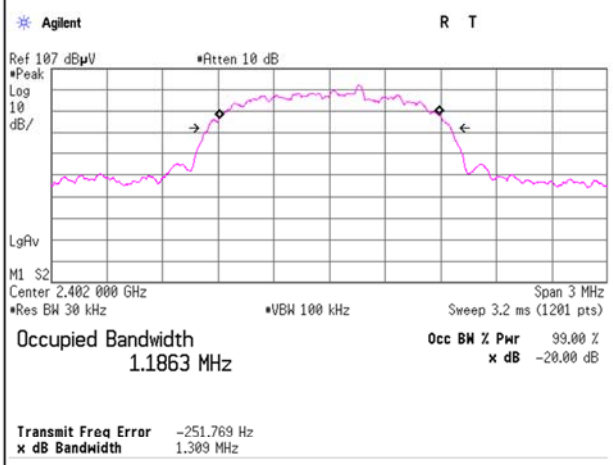


2480 MHz

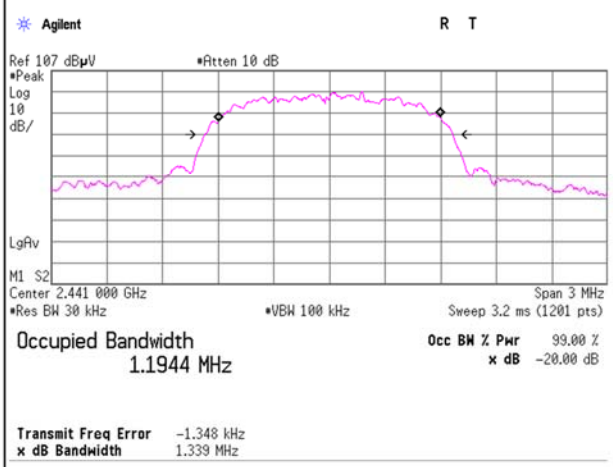


3DH5

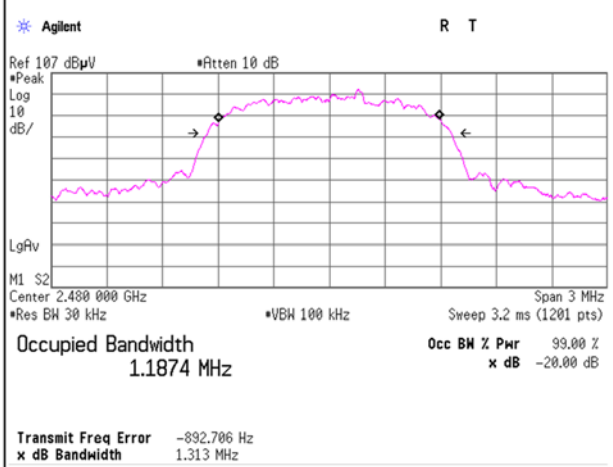
2402 MHz



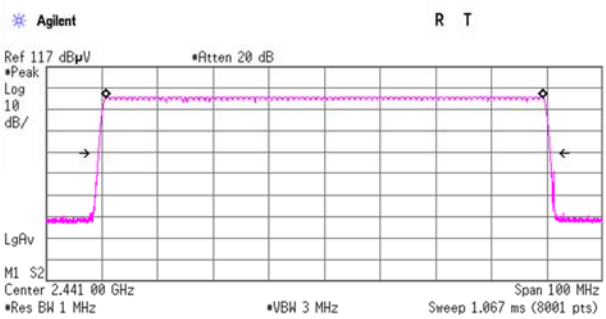
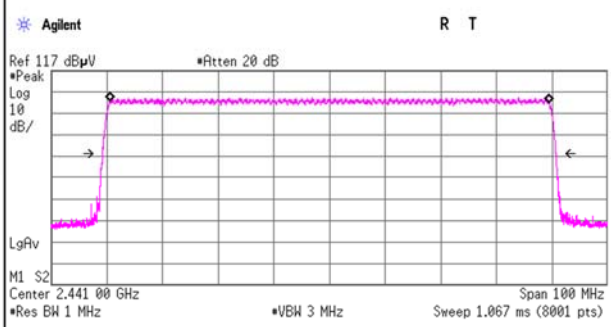
2441 MHz



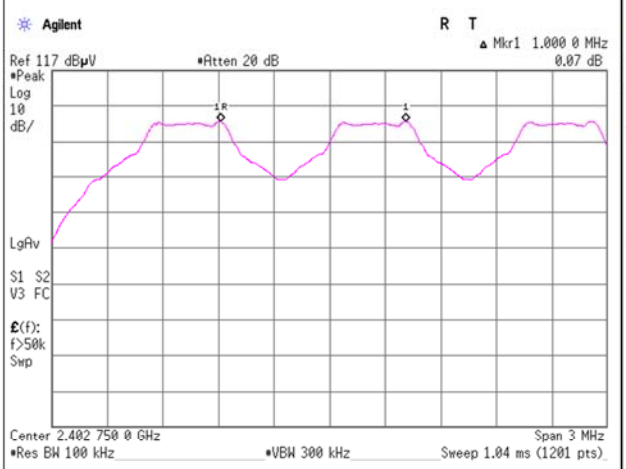
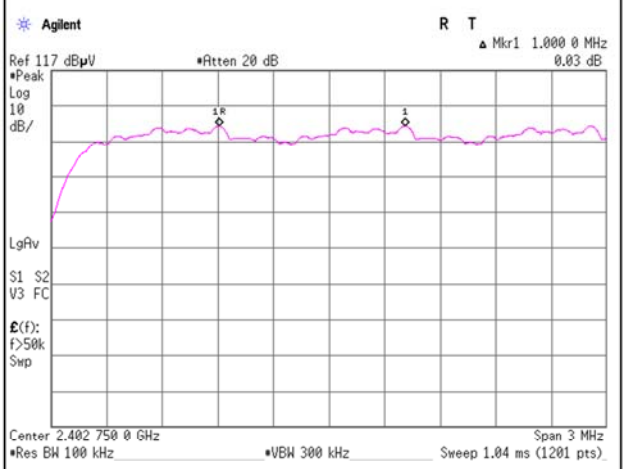
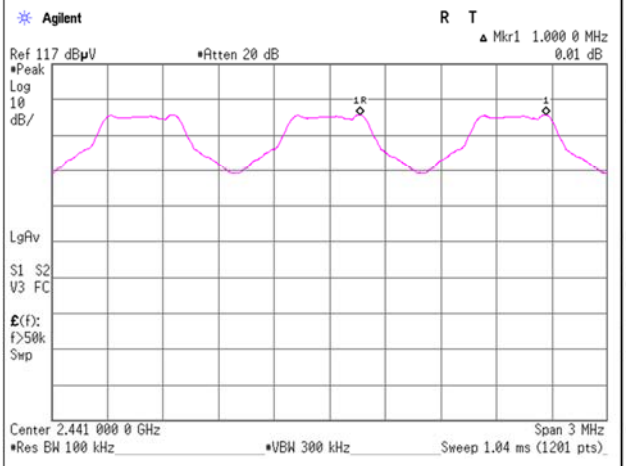
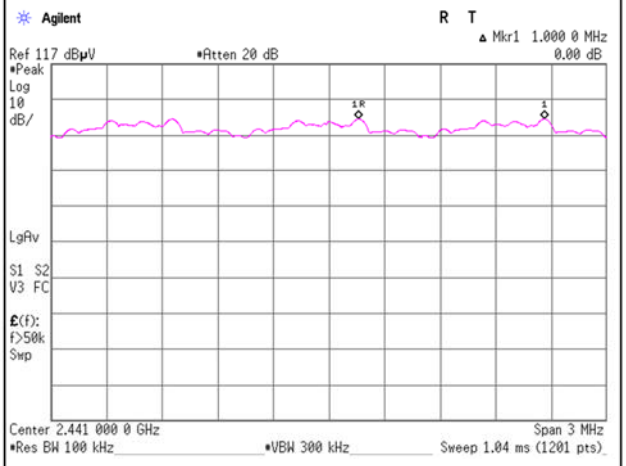
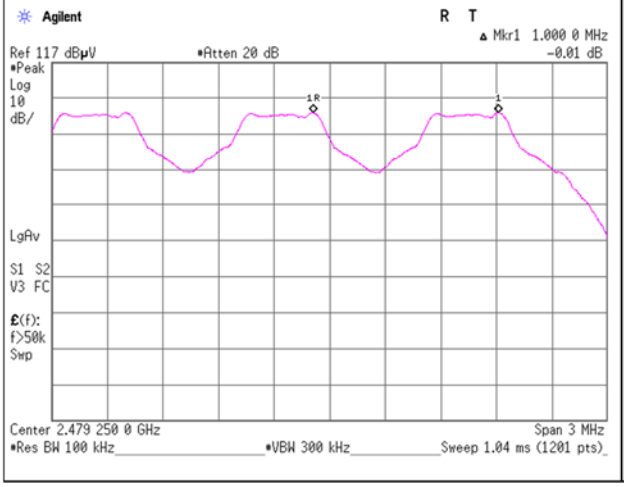
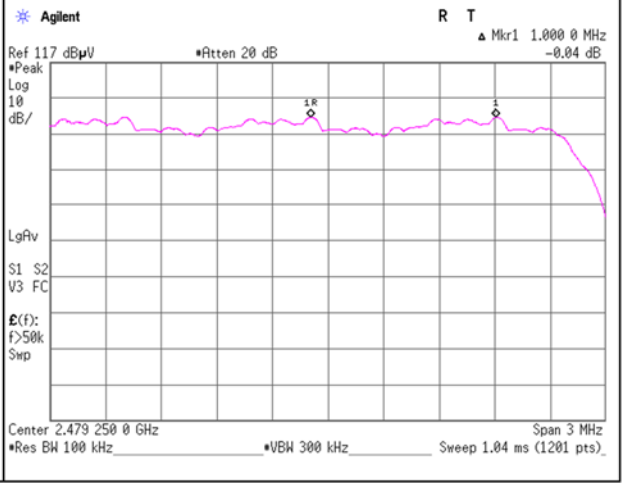
2480 MHz



20 dB Bandwidth & 99 % Occupied Bandwidth

DH5	3DH5
Hopping On	Hopping On
	

Carrier Frequency Separation

DH5	3DH5
2402 MHz	2402 MHz
	
2441 MHz	2441 MHz
	
2480 MHz	2480 MHz
	

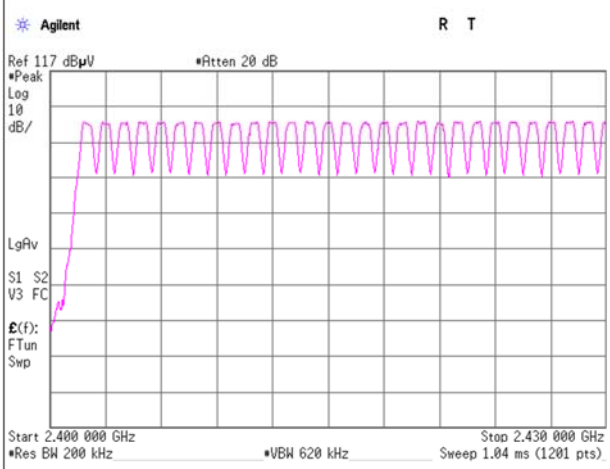
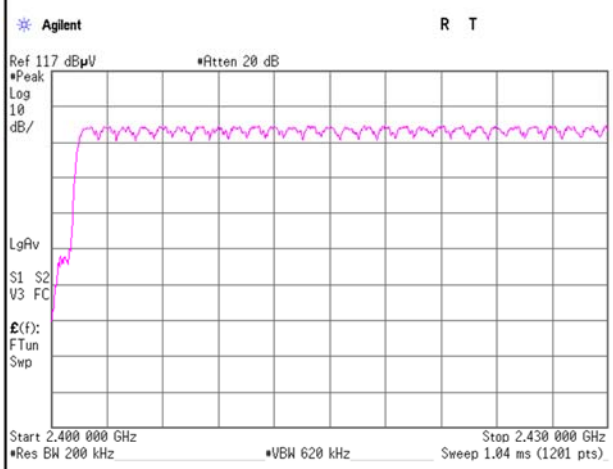
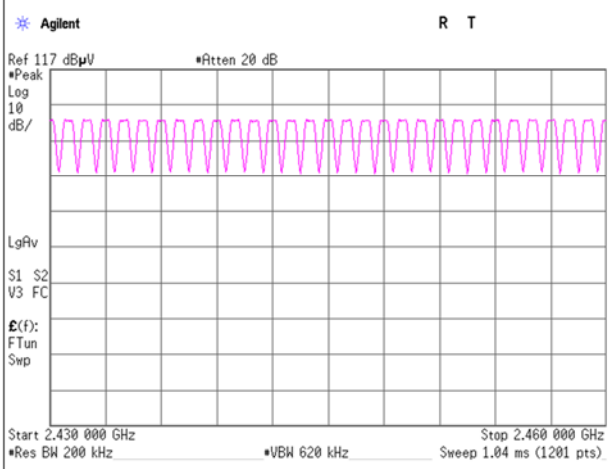
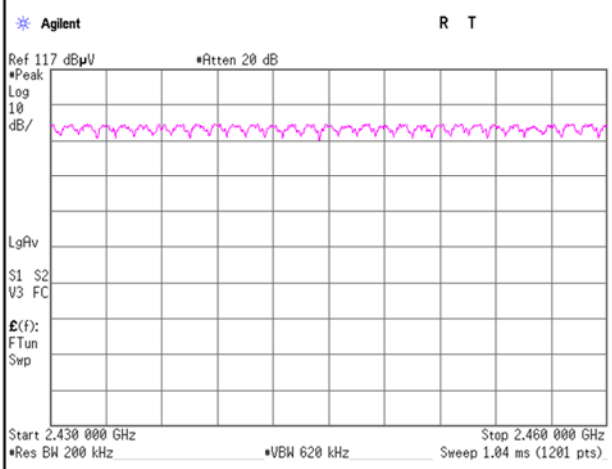
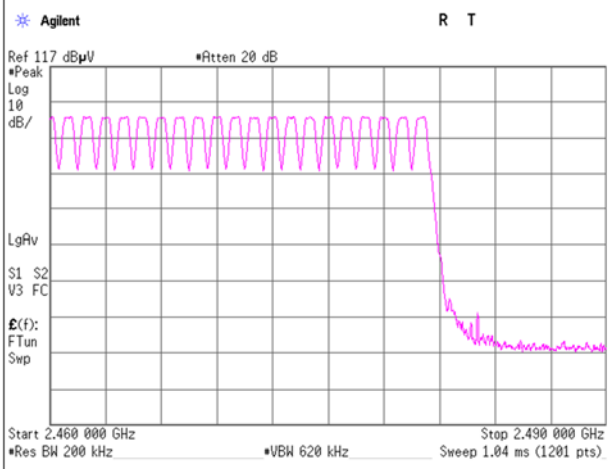
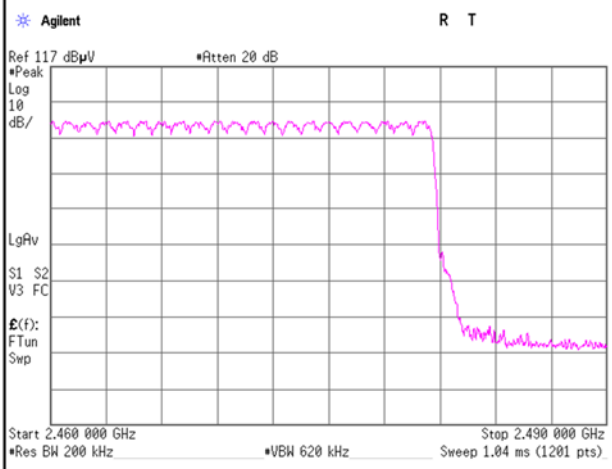
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15

Test was not performed at AFH mode whose number of hopping channel is
20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

Number of Hopping Frequency

DH5	3DH5
Hopping On (1/3)	Hopping On (1/3)
	
Hopping On (2/3)	Hopping On (2/3)
	
Hopping On (3/3)	Hopping On (3/3)
	

Dwell time

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4)				Length of transmission [ms]	Result [ms]	Limit [ms]
DH1	51.0 times	/ 5 s	x 31.6 s	= 323 times	0.401	129	400
DH3	27.8 times	/ 5 s	x 31.6 s	= 176 times	1.658	292	400
DH5	21.6 times	/ 5 s	x 31.6 s	= 137 times	2.908	398	400
3DH1	51.6 times	/ 5 s	x 31.6 s	= 327 times	0.405	132	400
3DH3	26.2 times	/ 5 s	x 31.6 s	= 166 times	1.656	275	400
3DH5	21.6 times	/ 5 s	x 31.6 s	= 137 times	2.907	398	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.

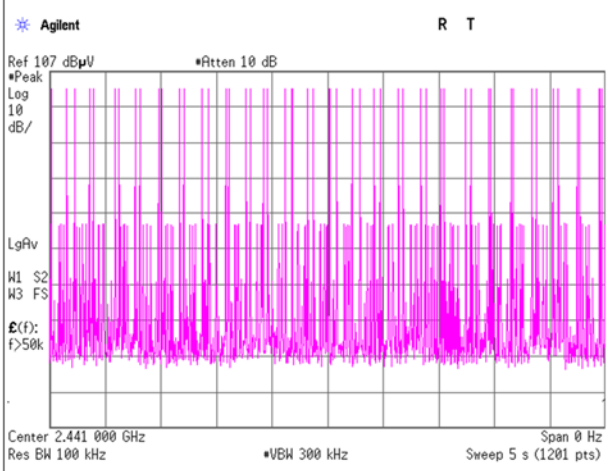
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	52	50	52	50	51
DH3	30	25	28	26	30	27.8
DH5	23	22	21	21	21	21.6
3DH1	51	52	52	52	51	51.6
3DH3	26	24	27	28	26	26.2
3DH5	20	22	22	22	22	21.6

Sample Calculation

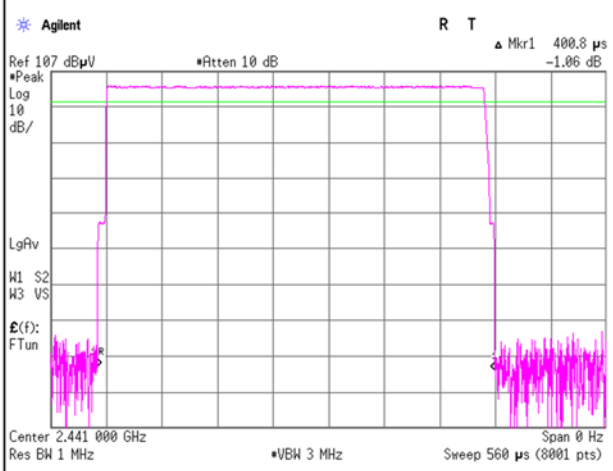
Average = Summation (Sampling 1 to 5) / 5

This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4 s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4 s regardless of packet size. This is confirmed in the test report for N = 79.

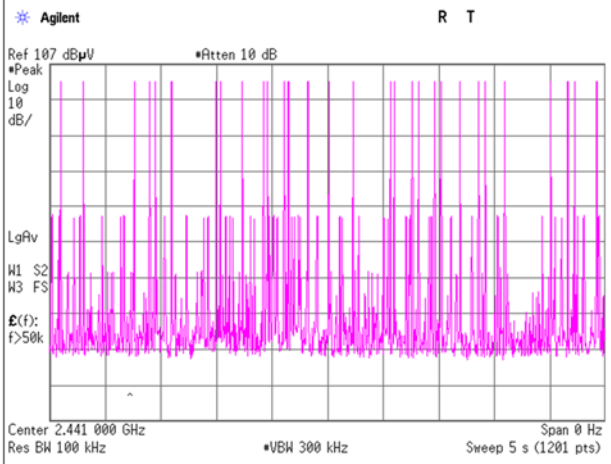
DH1 (1/2)
(Representative chart)



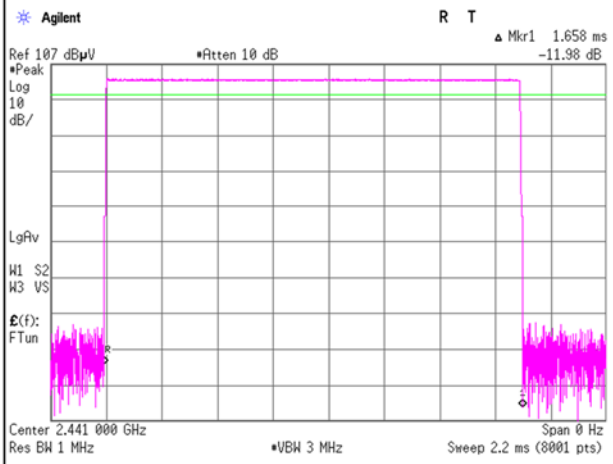
DH1 (2/2)



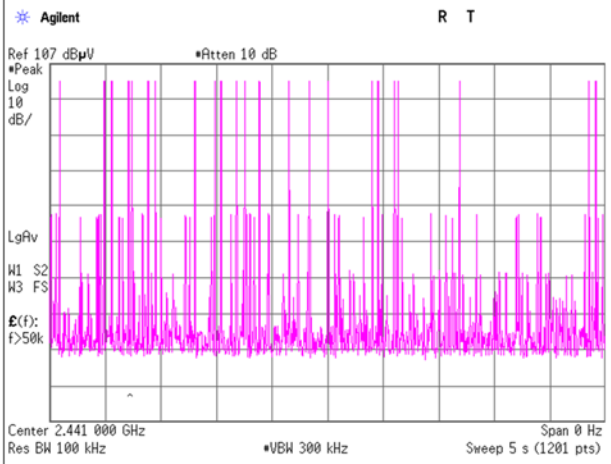
DH3 (1/2)
(Representative chart)



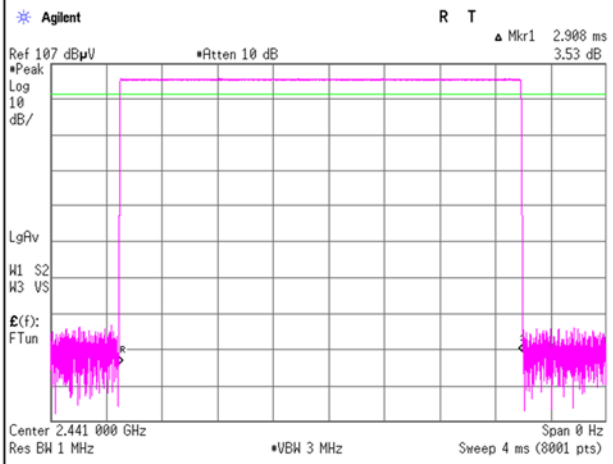
DH3 (2/2)



DH5 (1/2)
(Representative chart)

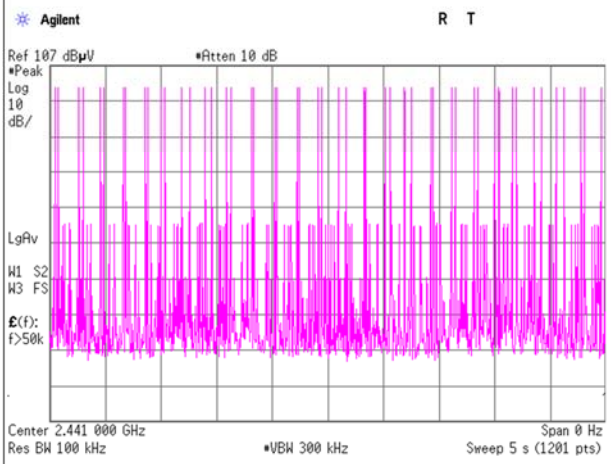


DH5 (2/2)

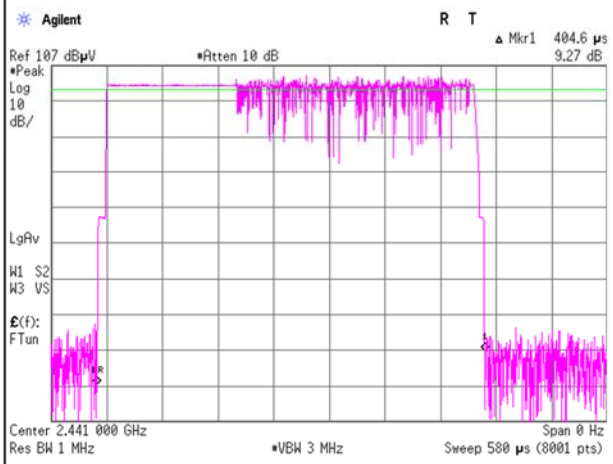


Dwell time

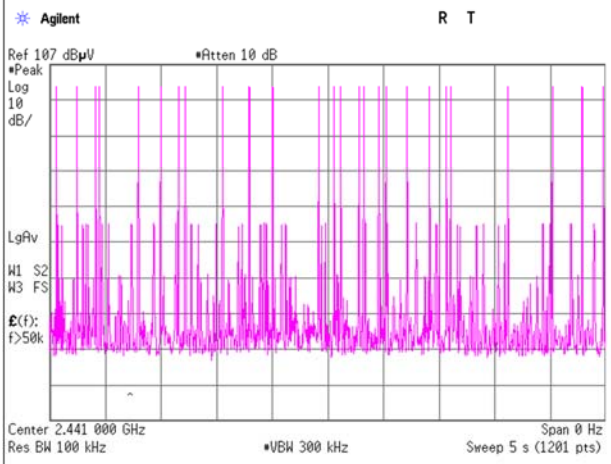
3DH1 (1/2)
(Representative chart)



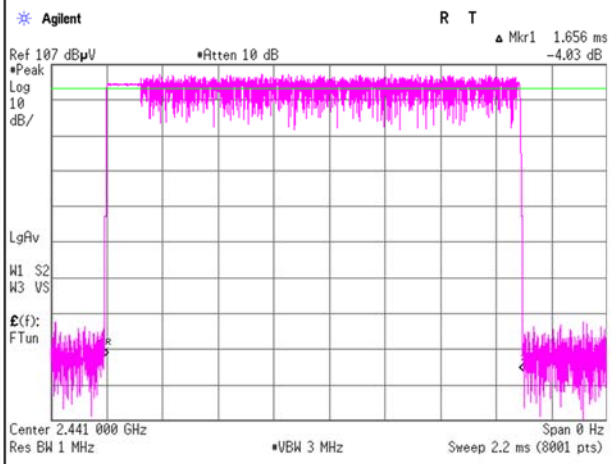
3DH1 (2/2)



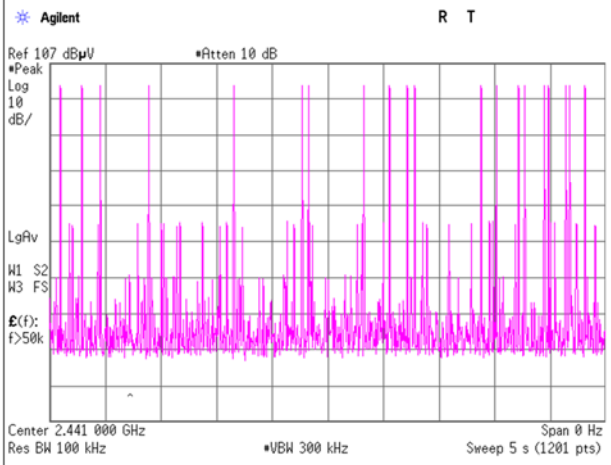
3DH3 (1/2)
(Representative chart)



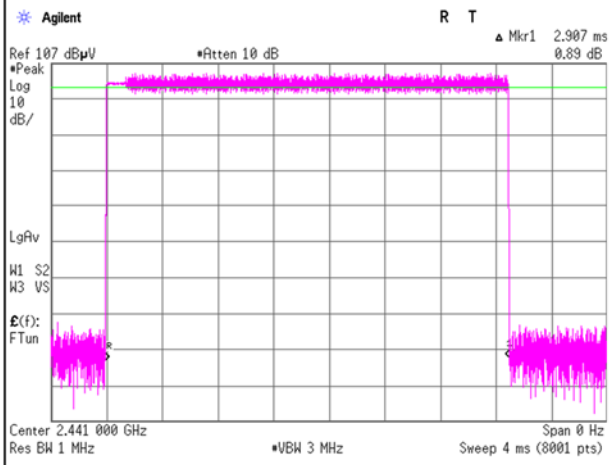
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power/ Average Output Power

(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off

Maximum peak output power

					Conducted Power					e.i.r.p. for RSS-247					
Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402	-5.06	2.10	9.91	6.95	4.95	20.97	125	14.02	-1.60	5.35	3.43	36.02	4000	30.67
DH5	2441	-4.88	2.11	9.91	7.14	5.18	20.97	125	13.83	-1.60	5.54	3.58	36.02	4000	30.48
DH5	2480	-4.82	2.13	9.91	7.22	5.27	20.97	125	13.75	-1.60	5.62	3.65	36.02	4000	30.40
2DH5	2402	-3.31	2.10	9.91	8.70	7.41	20.97	125	12.27	-1.60	7.10	5.13	36.02	4000	28.92
2DH5	2441	-3.17	2.11	9.91	8.85	7.67	20.97	125	12.12	-1.60	7.25	5.31	36.02	4000	28.77
2DH5	2480	-3.12	2.13	9.91	8.92	7.80	20.97	125	12.05	-1.60	7.32	5.40	36.02	4000	28.70
3DH5	2402	-2.63	2.10	9.91	9.38	8.67	20.97	125	11.59	-1.60	7.78	6.00	36.02	4000	28.24
3DH5	2441	-2.49	2.11	9.91	9.53	8.97	20.97	125	11.44	-1.60	7.93	6.21	36.02	4000	28.09
3DH5	2480	-2.49	2.13	9.91	9.55	9.02	20.97	125	11.42	-1.60	7.95	6.24	36.02	4000	28.07

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

Test was not performed at AFH mode, because the decrease of number of channel (min: 20 ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20 dB BW without 2/3 relaxation, 125 mW power limit was applied to it.

Average power (Reference data for RF Exposure)

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402	-6.41	2.10	9.91	5.60	3.63	1.11	6.71	4.69
DH5	2441	-6.21	2.11	9.91	5.81	3.81	1.11	6.92	4.92
DH5	2480	-6.12	2.13	9.91	5.92	3.91	1.11	7.03	5.04
2DH5	2402	-7.69	2.10	9.91	4.32	2.70	1.11	5.43	3.49
2DH5	2441	-7.50	2.11	9.91	4.52	2.83	1.11	5.63	3.66
2DH5	2480	-7.39	2.13	9.91	4.65	2.92	1.11	5.76	3.77
3DH5	2402	-7.69	2.10	9.91	4.32	2.70	1.11	5.43	3.49
3DH5	2441	-7.49	2.11	9.91	4.53	2.84	1.11	5.64	3.66
3DH5	2480	-7.37	2.13	9.91	4.67	2.93	1.11	5.78	3.78

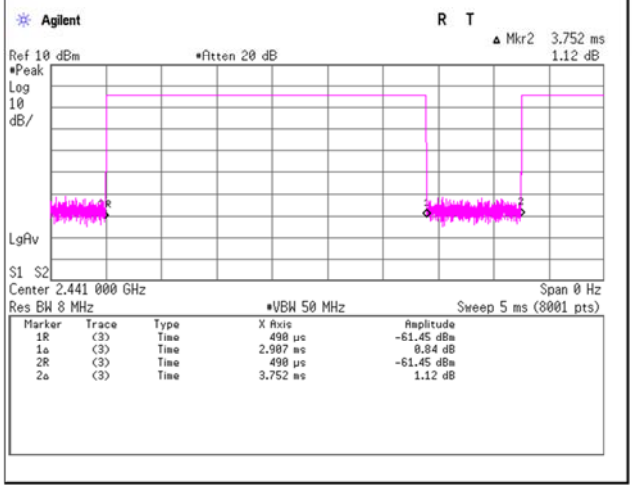
Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Result (Time average) + Duty factor

Burst Rate Confirmation

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off

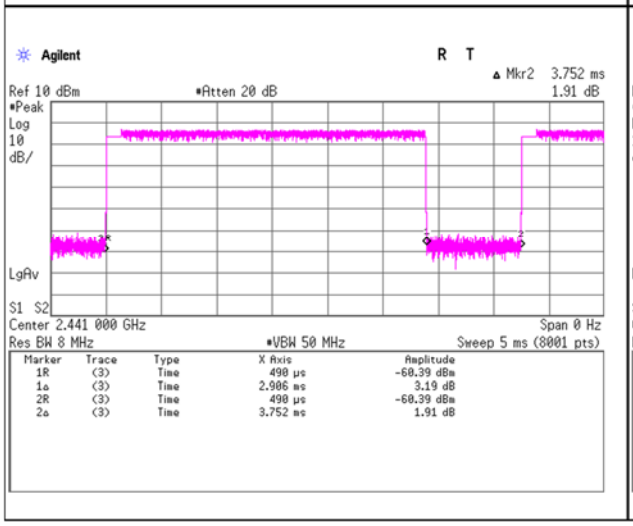
DH5

Tx on / (Tx on + Tx off) =	**0.775**
Tx on / (Tx on + Tx off) * 100 =	**77.5 %**
Duty factor = 10 * log (3.752 / 2.907) =	**1.11 dB**
VBW: 1 / on time = 341.76 Hz <	**360.00 Hz**



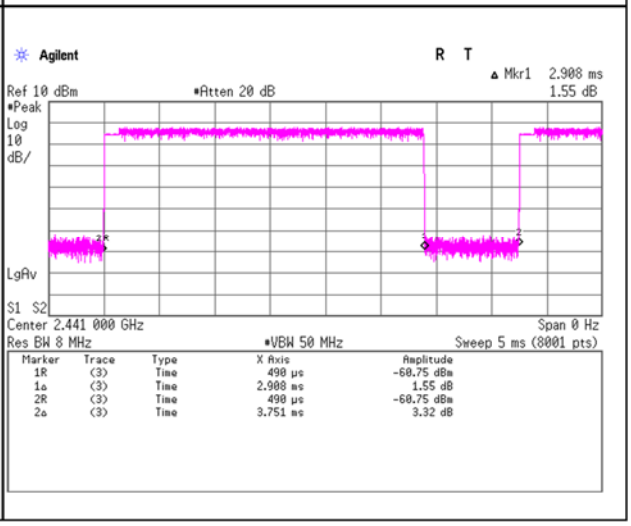
2DH5

Tx on / (Tx on + Tx off) =	**0.775**
Tx on / (Tx on + Tx off) * 100 =	**77.5 %**
Duty factor = 10 * log (3.752 / 2.906) =	**1.11 dB**
VBW: 1 / on time = 341.53 Hz <	**360.00 Hz**



3DH5

Tx on / (Tx on + Tx off) =	**0.775**
Tx on / (Tx on + Tx off) * 100 =	**77.5 %**
Duty factor = 10 * log (3.751 / 2.908) =	**1.11 dB**
VBW: 1 / on time = 341.3 Hz <	**360.00 Hz**



Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.1	No.1
Date	December 11, 2022	December 16, 2022	December 18, 2022
Temperature / Humidity	22 deg.C, 35 %RH	22 deg.C, 37 %RH	24 deg.C, 40 %RH
Engineer	Akihiro Oda	Hiromasa Sato	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 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	44.27	28.57	14.19	38.81	2.46	50.68	73.9	23.2	136	133	-
Hori.	3603.000	PK	47.45	29.01	6.88	39.61	2.46	46.19	73.9	27.7	131	139	-
Hori.	4804.000	PK	46.37	31.17	7.42	39.73	2.46	47.69	73.9	26.2	145	128	-
Hori.	7206.000	PK	45.07	36.88	9.13	39.52	2.46	54.02	73.9	19.8	135	120	-
Hori.	9608.000	PK	44.64	38.11	10.79	39.73	2.46	56.27	73.9	17.6	150	0	-
Hori.	2390.000	AV	33.17	28.57	14.19	38.81	2.46	39.58	53.9	14.3	136	133	VBW: 360 Hz
Hori.	3603.000	AV	34.73	29.01	6.88	39.61	2.46	33.47	53.9	20.4	131	139	VBW: 360 Hz
Hori.	4804.000	AV	32.41	31.17	7.42	39.73	2.46	33.73	53.9	20.1	145	128	VBW: 360 Hz
Hori.	7206.000	AV	32.30	36.88	9.13	39.52	2.46	41.25	53.9	12.6	135	120	VBW: 360 Hz
Hori.	9608.000	AV	31.74	38.11	10.79	39.73	2.46	43.37	53.9	10.5	150	0	VBW: 360 Hz , Floor noise
Vert.	2390.000	PK	45.58	28.57	14.19	38.81	2.46	51.99	73.9	21.9	146	136	-
Vert.	3603.000	PK	46.16	29.01	6.88	39.61	2.46	44.90	73.9	29.0	147	164	-
Vert.	4804.000	PK	45.38	31.17	7.42	39.73	2.46	46.70	73.9	27.2	148	168	-
Vert.	7206.000	PK	45.16	36.88	9.13	39.52	2.46	54.11	73.9	19.7	151	132	-
Vert.	9608.000	PK	44.51	38.11	10.79	39.73	2.46	56.14	73.9	17.7	150	0	-
Vert.	2390.000	AV	33.05	28.57	14.19	38.81	2.46	39.46	53.9	14.4	146	136	VBW: 360 Hz
Vert.	3603.000	AV	34.46	29.01	6.88	39.61	2.46	33.20	53.9	20.7	147	164	VBW: 360 Hz
Vert.	4804.000	AV	32.53	31.17	7.42	39.73	2.46	33.85	53.9	20.0	148	168	VBW: 360 Hz
Vert.	7206.000	AV	32.22	36.88	9.13	39.52	2.46	41.17	53.9	12.7	151	132	VBW: 360 Hz
Vert.	9608.000	AV	31.91	38.11	10.79	39.73	2.46	43.54	53.9	**10.3**	150	0	VBW: 360 Hz , 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 (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

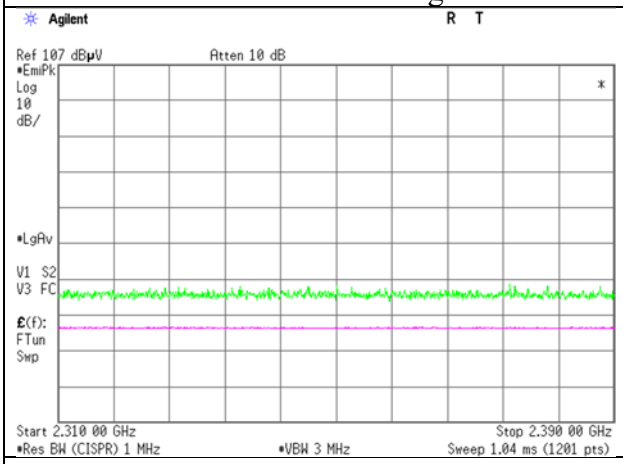
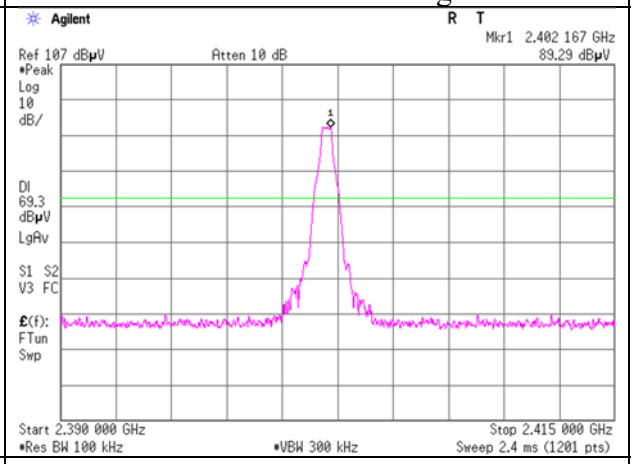
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

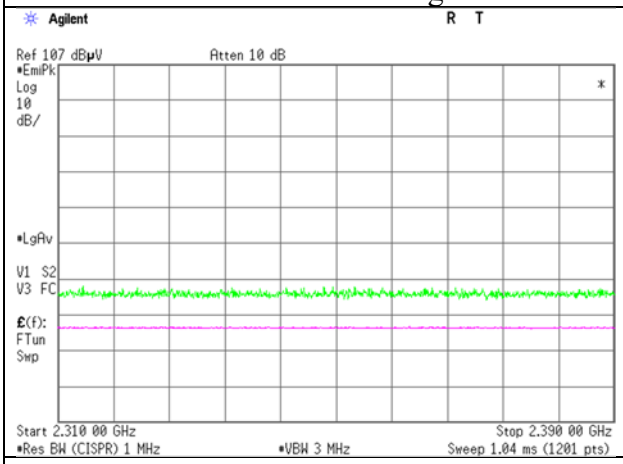
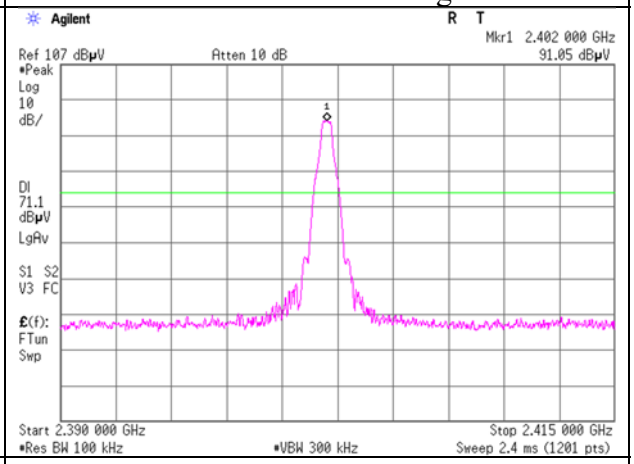
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.13	28.55	14.21	38.80	2.46	96.55	-	-	Carrier
Hori.	2400.000	PK	40.16	28.55	14.20	38.81	2.46	46.56	76.5	29.9	-
Vert.	2402.000	PK	92.00	28.55	14.21	38.80	2.46	98.42	-	-	Carrier
Vert.	2400.000	PK	41.82	28.55	14.20	38.81	2.46	48.22	78.4	30.1	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 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.2
Date	December 11, 2022
Temperature / Humidity	22 deg.C, 35 %RH
Engineer	Akihiro Oda
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz, Left

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.1	No.1
Date	December 11, 2022	December 16, 2022	December 18, 2022
Temperature / Humidity	22 deg.C, 35 %RH	22 deg.C, 37 %RH	24 deg.C, 40 %RH
Engineer	Akihiro Oda	Hiromasa Sato	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 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.	3661.500	PK	48.57	29.15	6.89	39.60	2.46	47.47	73.9	26.4	133	115	-
Hori.	4882.000	PK	45.49	31.23	7.48	39.76	2.46	46.90	73.9	27.0	155	137	-
Hori.	7323.000	PK	44.95	36.93	9.20	39.48	2.46	54.06	73.9	19.8	143	109	-
Hori.	9764.000	PK	44.47	38.56	10.79	39.66	2.46	56.62	73.9	17.2	150	0	-
Hori.	3661.500	AV	37.91	29.15	6.89	39.60	2.46	36.81	53.9	17.0	133	115	VBW: 360 Hz
Hori.	4882.000	AV	33.25	31.23	7.48	39.76	2.46	34.66	53.9	19.2	155	137	VBW: 360 Hz
Hori.	7323.000	AV	32.57	36.93	9.20	39.48	2.46	41.68	53.9	12.2	143	109	VBW: 360 Hz
Hori.	9764.000	AV	32.90	38.56	10.79	39.66	2.46	45.05	53.9	**8.8**	150	0	VBW: 360 Hz , Floor noise
Vert.	3661.500	PK	47.45	29.15	6.89	39.60	2.46	46.35	73.9	27.5	149	176	-
Vert.	4882.000	PK	45.21	31.23	7.48	39.76	2.46	46.62	73.9	27.2	144	160	-
Vert.	7323.000	PK	44.63	36.93	9.20	39.48	2.46	53.74	73.9	20.1	156	148	-
Vert.	9764.000	PK	44.69	38.56	10.79	39.66	2.46	56.84	73.9	17.0	150	0	-
Vert.	3661.500	AV	37.65	29.15	6.89	39.60	2.46	36.55	53.9	17.3	149	176	VBW: 360 Hz
Vert.	4882.000	AV	33.27	31.23	7.48	39.76	2.46	34.68	53.9	19.2	144	160	VBW: 360 Hz
Vert.	7323.000	AV	32.41	36.93	9.20	39.48	2.46	41.52	53.9	12.3	156	148	VBW: 360 Hz
Vert.	9764.000	AV	32.93	38.56	10.79	39.66	2.46	45.08	53.9	**8.8**	150	0	VBW: 360 Hz , 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 (3.98 m / 3.0 m) = 2.46 dB

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

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.1	No.1
Date	December 11, 2022	December 16, 2022	December 18, 2022
Temperature / Humidity	22 deg.C, 35 %RH	22 deg.C, 37 %RH	24 deg.C, 40 %RH
Engineer	Akihiro Oda	Hiromasa Sato	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 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	47.83	28.44	14.29	38.76	2.46	54.26	73.9	19.6	180	162	-
Hori.	3720.000	PK	48.20	29.28	6.90	39.60	2.46	47.24	73.9	26.6	110	124	-
Hori.	4960.000	PK	46.07	31.40	7.55	39.79	2.46	47.69	73.9	26.2	143	133	-
Hori.	7440.000	PK	45.66	37.02	9.26	39.43	2.46	54.97	73.9	18.9	147	122	-
Hori.	9920.000	PK	44.94	38.57	10.79	39.60	2.46	57.16	73.9	16.7	150	0	-
Hori.	2483.500	AV	33.22	28.44	14.29	38.76	2.46	39.65	53.9	14.2	180	162	VBW: 360 Hz
Hori.	3720.000	AV	37.82	29.28	6.90	39.60	2.46	36.86	53.9	17.0	110	124	VBW 360 Hz
Hori.	4960.000	AV	33.57	31.40	7.55	39.79	2.46	35.19	53.9	18.7	143	133	VBW 360 Hz
Hori.	7440.000	AV	32.71	37.02	9.26	39.43	2.46	42.02	53.9	11.8	147	122	VBW 360 Hz
Hori.	9920.000	AV	32.53	38.57	10.79	39.60	2.46	44.75	53.9	**9.1**	150	0	VBW 360 Hz , Floor noise
Vert.	2483.500	PK	46.35	28.44	14.29	38.76	2.46	52.78	73.9	21.1	160	141	-
Vert.	3720.000	PK	47.57	29.28	6.90	39.60	2.46	46.61	73.9	27.2	156	155	-
Vert.	4960.000	PK	45.93	31.40	7.55	39.79	2.46	47.55	73.9	26.3	150	168	-
Vert.	7440.000	PK	45.90	37.02	9.26	39.43	2.46	55.21	73.9	18.6	153	159	-
Vert.	9920.000	PK	44.45	38.57	10.79	39.60	2.46	56.67	73.9	17.2	150	0	-
Vert.	2483.500	AV	33.12	28.44	14.29	38.76	2.46	39.55	53.9	14.3	160	141	VBW: 360 Hz
Vert.	3720.000	AV	36.97	29.28	6.90	39.60	2.46	36.01	53.9	17.8	156	155	VBW 360 Hz
Vert.	4960.000	AV	33.31	31.40	7.55	39.79	2.46	34.93	53.9	18.9	150	168	VBW 360 Hz
Vert.	7440.000	AV	32.73	37.02	9.26	39.43	2.46	42.04	53.9	11.8	153	159	VBW 360 Hz
Vert.	9920.000	AV	32.44	38.57	10.79	39.60	2.46	44.66	53.9	9.2	150	0	VBW 360 Hz , 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 (3.98 m / 3.0 m) = 2.46 dB

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

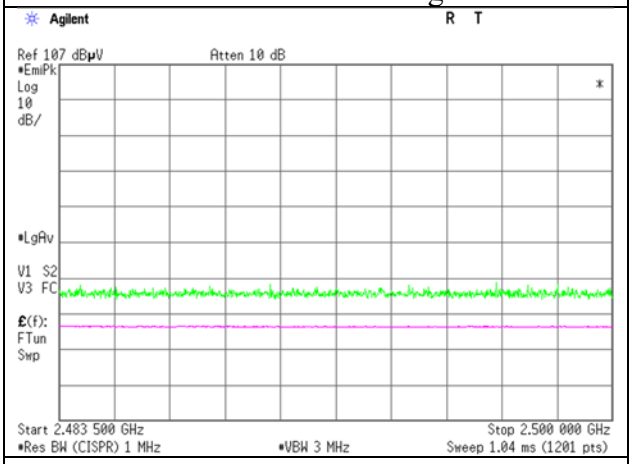
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	December 11, 2022
Temperature / Humidity	22 deg.C, 35 %RH
Engineer	Akihiro Oda
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz, Left

Horizontal

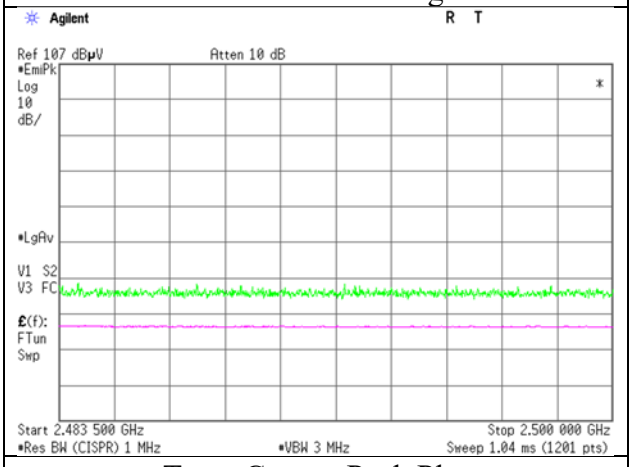
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.1	No.1
Date	December 11, 2022	December 16, 2022	December 18, 2022
Temperature / Humidity	22 deg.C, 35 %RH	22 deg.C, 37 %RH	24 deg.C, 40 %RH
Engineer	Akihiro Oda	Hiromasa Sato	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 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	45.53	28.57	14.19	38.81	2.46	51.94	73.9	21.9	146	159	-
Hori.	3603.000	PK	47.82	29.01	6.88	39.61	2.46	46.56	73.9	27.3	127	148	-
Hori.	4804.000	PK	45.85	31.17	7.42	39.73	2.46	47.17	73.9	26.7	149	117	-
Hori.	7206.000	PK	45.16	36.88	9.13	39.52	2.46	54.11	73.9	19.7	133	122	-
Hori.	9608.000	PK	44.48	38.11	10.79	39.73	2.46	56.11	73.9	17.7	150	0	-
Hori.	2390.000	AV	33.08	28.57	14.19	38.81	2.46	39.49	53.9	14.4	146	159	VBW: 360 Hz
Hori.	3603.000	AV	37.18	29.01	6.88	39.61	2.46	35.92	53.9	17.9	127	148	VBW: 360 Hz
Hori.	4804.000	AV	33.25	31.17	7.42	39.73	2.46	34.57	53.9	19.3	149	117	VBW: 360 Hz
Hori.	7206.000	AV	32.39	36.88	9.13	39.52	2.46	41.34	53.9	12.5	133	122	VBW: 360 Hz
Hori.	9608.000	AV	31.68	38.11	10.79	39.73	2.46	43.31	53.9	**10.5**	150	0	VBW: 360 Hz , Floor noise
Vert.	2390.000	PK	44.60	28.57	14.19	38.81	2.46	51.01	73.9	22.8	135	156	-
Vert.	3603.000	PK	47.70	29.01	6.88	39.61	2.46	46.44	73.9	27.4	148	161	-
Vert.	4804.000	PK	45.38	31.17	7.42	39.73	2.46	46.70	73.9	27.2	152	169	-
Vert.	7206.000	PK	45.64	36.88	9.13	39.52	2.46	54.59	73.9	19.3	150	133	-
Vert.	9608.000	PK	44.21	38.11	10.79	39.73	2.46	55.84	73.9	18.0	150	0	-
Vert.	2390.000	AV	33.05	28.57	14.19	38.81	2.46	39.46	53.9	14.4	135	156	VBW: 360 Hz
Vert.	3603.000	AV	36.56	29.01	6.88	39.61	2.46	35.30	53.9	18.6	148	161	VBW: 360 Hz
Vert.	4804.000	AV	33.11	31.17	7.42	39.73	2.46	34.43	53.9	19.4	152	169	VBW: 360 Hz
Vert.	7206.000	AV	32.62	36.88	9.13	39.52	2.46	41.57	53.9	12.3	150	133	VBW: 360 Hz
Vert.	9608.000	AV	31.57	38.11	10.79	39.73	2.46	43.20	53.9	10.7	150	0	VBW: 360 Hz , 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 (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

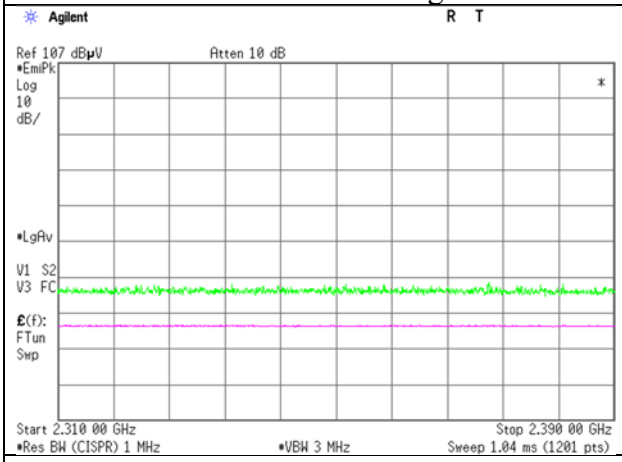
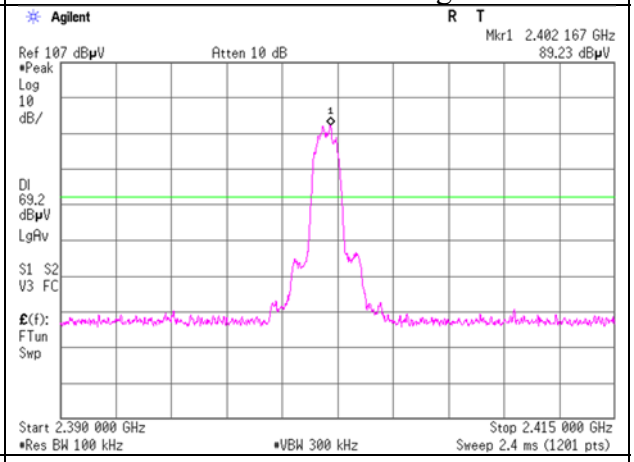
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

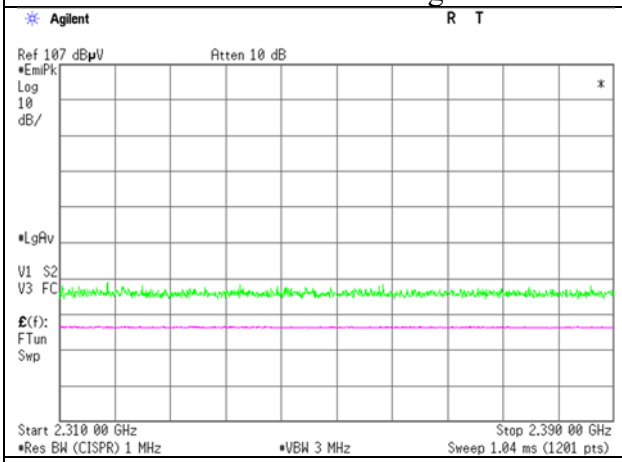
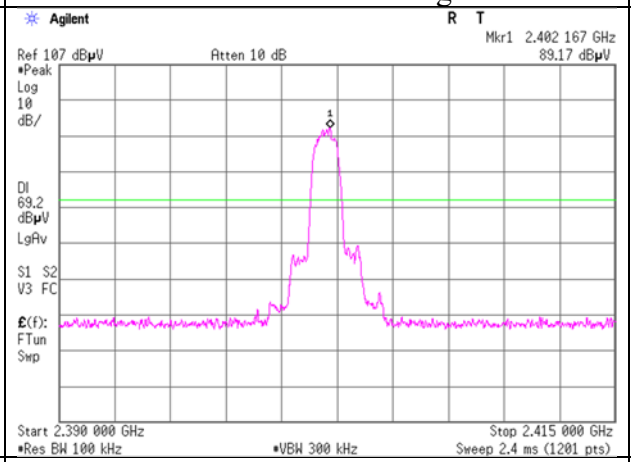
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	89.19	28.55	14.21	38.80	2.46	95.61	-	-	Carrier
Hori.	2399.545	PK	42.74	28.55	14.20	38.81	2.46	49.14	75.6	26.4	-
Hori.	2400.000	PK	41.32	28.55	14.20	38.81	2.46	47.72	75.6	27.8	-
Vert.	2402.000	PK	89.28	28.55	14.21	38.80	2.46	95.70	-	-	Carrier
Vert.	2399.683	PK	42.74	28.55	14.20	38.81	2.46	49.14	75.7	26.5	-
Vert.	2400.000	PK	41.67	28.55	14.20	38.81	2.46	48.07	75.7	27.6	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 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.2
Date	December 11, 2022
Temperature / Humidity	22 deg.C, 35 %RH
Engineer	Akihiro Oda
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz, Left

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.1	No.1
Date	December 11, 2022	December 16, 2022	December 18, 2022
Temperature / Humidity	22 deg.C, 35 %RH	22 deg.C, 37 %RH	24 deg.C, 40 %RH
Engineer	Akihiro Oda	Hiromasa Sato	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 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.	3661.500	PK	47.51	29.15	6.89	39.60	2.46	46.41	73.9	27.4	132	123	-
Hori.	4882.000	PK	45.27	31.23	7.48	39.76	2.46	46.68	73.9	27.2	151	139	-
Hori.	7323.000	PK	44.64	36.93	9.20	39.48	2.46	53.75	73.9	20.1	149	124	-
Hori.	9764.000	PK	44.38	38.56	10.79	39.66	2.46	56.53	73.9	17.3	150	0	-
Hori.	3661.500	AV	37.24	29.15	6.89	39.60	2.46	36.14	53.9	17.7	132	123	VBW: 360 Hz
Hori.	4882.000	AV	33.10	31.23	7.48	39.76	2.46	34.51	53.9	19.3	151	139	VBW: 360 Hz
Hori.	7323.000	AV	32.43	36.93	9.20	39.48	2.46	41.54	53.9	12.3	149	124	VBW: 360 Hz
Hori.	9764.000	AV	32.52	38.56	10.79	39.66	2.46	44.67	53.9	9.2	150	0	VBW: 360 Hz , Floor noise
Vert.	3661.500	PK	47.29	29.15	6.89	39.60	2.46	46.19	73.9	27.7	147	170	-
Vert.	4882.000	PK	45.16	31.23	7.48	39.76	2.46	46.57	73.9	27.3	153	164	-
Vert.	7323.000	PK	44.26	36.93	9.20	39.48	2.46	53.37	73.9	20.5	155	137	-
Vert.	9764.000	PK	44.47	38.56	10.79	39.66	2.46	56.62	73.9	17.2	150	0	-
Vert.	3661.500	AV	37.05	29.15	6.89	39.60	2.46	35.95	53.9	17.9	147	170	VBW: 360 Hz
Vert.	4882.000	AV	33.43	31.23	7.48	39.76	2.46	34.84	53.9	19.0	153	164	VBW: 360 Hz
Vert.	7323.000	AV	32.48	36.93	9.20	39.48	2.46	41.59	53.9	12.3	155	137	VBW: 360 Hz
Vert.	9764.000	AV	32.81	38.56	10.79	39.66	2.46	44.96	53.9	**8.9**	150	0	VBW: 360 Hz , 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 (3.98 m / 3.0 m) = 2.46 dB

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

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.2	No.2	No.1	No.1
Date	December 19, 2022	December 11, 2022	December 16, 2022	December 18, 2022
Temperature / Humidity	20 deg.C, 27 %RH	22 deg.C, 35 %RH	22 deg.C, 37 %RH	24 deg.C, 40 %RH
Engineer	Miku Ikudome	Akihiro Oda	Hiromasa Sato	Hiromasa Sato
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 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.	85.058	QP	21.09	7.27	7.80	31.90	0.00	4.26	40.0	35.7	150	0	-
Hori.	194.962	QP	20.87	16.57	9.00	31.80	0.00	14.64	43.5	28.8	150	0	-
Hori.	888.569	QP	19.79	22.13	9.67	30.93	0.00	20.66	46.0	25.3	150	0	-
Hori.	2483.500	PK	44.26	28.44	14.29	38.76	2.46	50.69	73.9	23.2	113	153	-
Hori.	3720.000	PK	47.62	29.28	6.90	39.60	2.46	46.66	73.9	27.2	116	148	-
Hori.	4960.000	PK	45.33	31.40	7.55	39.79	2.46	46.95	73.9	26.9	148	126	-
Hori.	7440.000	PK	45.37	37.02	9.26	39.43	2.46	54.68	73.9	19.2	146	119	-
Hori.	9920.000	PK	44.82	38.57	10.79	39.60	2.46	57.04	73.9	16.8	150	0	-
Hori.	2483.500	AV	33.25	28.44	14.29	38.76	2.46	39.68	53.9	14.2	113	153	VBW: 360 Hz
Hori.	3720.000	AV	37.32	29.28	6.90	39.60	2.46	36.36	53.9	17.5	116	148	VBW 360 Hz
Hori.	4960.000	AV	33.15	31.40	7.55	39.79	2.46	34.77	53.9	19.1	148	126	VBW 360 Hz
Hori.	7440.000	AV	32.42	37.02	9.26	39.43	2.46	41.73	53.9	12.1	146	119	VBW 360 Hz
Hori.	9920.000	AV	32.31	38.57	10.79	39.60	2.46	44.53	53.9	**9.3**	150	0	VBW 360 Hz , Floor noise
Vert.	71.656	QP	31.01	6.49	7.61	31.91	0.00	13.20	40.0	26.8	233	202	-
Vert.	73.150	QP	28.10	6.40	7.63	31.91	0.00	10.22	40.0	29.7	236	205	-
Vert.	195.339	QP	20.81	16.57	9.00	31.79	0.00	14.59	43.5	28.9	150	0	-
Vert.	926.314	QP	19.80	22.23	9.85	30.73	0.00	21.15	46.0	24.8	150	0	-
Vert.	2483.500	PK	45.31	28.44	14.29	38.76	2.46	51.74	73.9	22.1	132	133	-
Vert.	3720.000	PK	47.31	29.28	6.90	39.60	2.46	46.35	73.9	27.5	153	147	-
Vert.	4960.000	PK	45.46	31.40	7.55	39.79	2.46	47.08	73.9	26.8	149	170	-
Vert.	7440.000	PK	45.33	37.02	9.26	39.43	2.46	54.64	73.9	19.2	151	157	-
Vert.	9920.000	PK	44.41	38.57	10.79	39.60	2.46	56.63	73.9	17.2	150	0	-
Vert.	2483.500	AV	33.08	28.44	14.29	38.76	2.46	39.51	53.9	14.3	132	133	VBW: 360 Hz
Vert.	3720.000	AV	36.38	29.28	6.90	39.60	2.46	35.42	53.9	18.4	153	147	VBW 360 Hz
Vert.	4960.000	AV	33.32	31.40	7.55	39.79	2.46	34.94	53.9	18.9	149	170	VBW 360 Hz
Vert.	7440.000	AV	32.65	37.02	9.26	39.43	2.46	41.96	53.9	11.9	151	157	VBW 360 Hz
Vert.	9920.000	AV	32.29	38.57	10.79	39.60	2.46	44.51	53.9	**9.3**	150	0	VBW 360 Hz , 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 (3.98 m / 3.0 m) = 2.46 dB

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

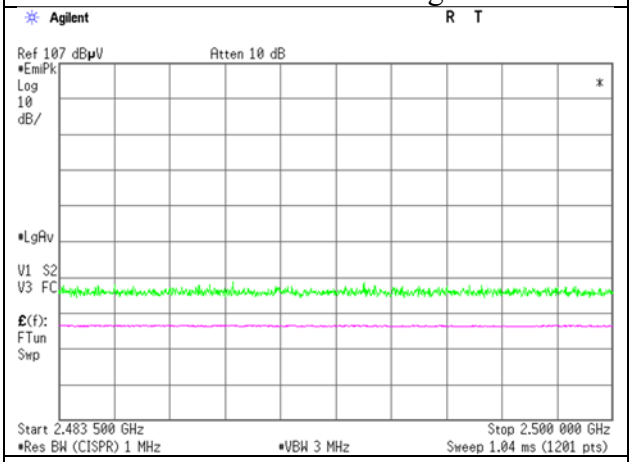
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	December 11, 2022
Temperature / Humidity	22 deg.C, 35 %RH
Engineer	Akihiro Oda
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz, Left

Horizontal

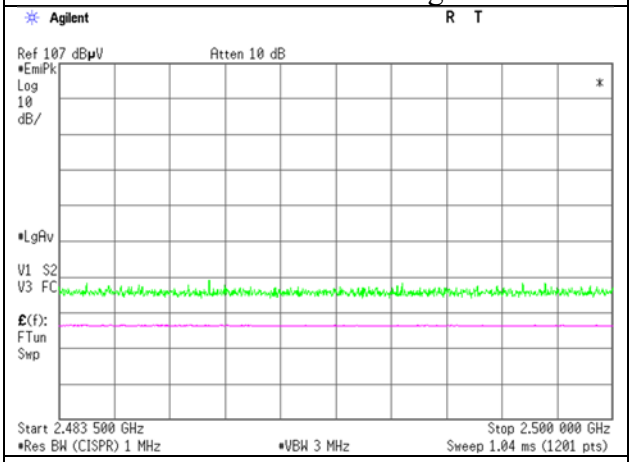
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.2	No.1
Date	December 10, 2022	December 11, 2022	December 18, 2022
Temperature / Humidity	20 deg.C, 33 %RH	22 deg.C, 35 %RH	24 deg.C, 40 %RH
Engineer	Shiro Kobayashi	Akihiro Oda	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 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	45.20	28.57	14.19	38.81	2.46	51.61	73.9	22.2	115	39	-
Hori.	3603.037	PK	49.49	29.71	6.43	38.28	2.46	49.81	73.9	24.0	128	147	-
Hori.	4804.000	PK	44.88	31.90	7.00	38.64	2.46	47.60	73.9	26.3	162	133	-
Hori.	7206.000	PK	44.68	37.57	8.40	39.24	2.46	53.87	73.9	20.0	148	180	-
Hori.	2390.000	AV	33.20	28.57	14.19	38.81	2.46	39.61	53.9	14.2	115	39	VBW: 360 Hz
Hori.	3603.037	AV	41.91	29.71	6.43	38.28	2.46	42.23	53.9	11.6	128	147	VBW: 360 Hz
Hori.	4804.000	AV	33.25	31.90	7.00	38.64	2.46	35.97	53.9	17.9	162	133	VBW: 360 Hz
Hori.	7206.000	AV	34.79	37.57	8.40	39.24	2.46	43.98	53.9	**9.9**	148	180	VBW: 360 Hz
Vert.	2390.000	PK	45.45	28.57	14.19	38.81	2.46	51.86	73.9	22.0	135	38	-
Vert.	3602.759	PK	50.49	29.71	6.43	38.28	2.46	50.81	73.9	23.0	141	109	-
Vert.	4804.000	PK	46.17	31.90	7.00	38.64	2.46	48.89	73.9	25.0	160	210	-
Vert.	7206.000	PK	45.03	37.57	8.40	39.24	2.46	54.22	73.9	19.6	150	0	-
Vert.	2390.000	AV	33.25	28.57	14.19	38.81	2.46	39.66	53.9	14.2	135	38	VBW: 360 Hz
Vert.	3602.759	AV	42.03	29.71	6.43	38.28	2.46	42.35	53.9	11.5	141	109	VBW: 360 Hz
Vert.	4804.000	AV	33.80	31.90	7.00	38.64	2.46	36.52	53.9	17.3	160	210	VBW: 360 Hz
Vert.	7206.000	AV	33.57	37.57	8.40	39.24	2.46	42.76	53.9	11.1	150	0	VBW: 360 Hz

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

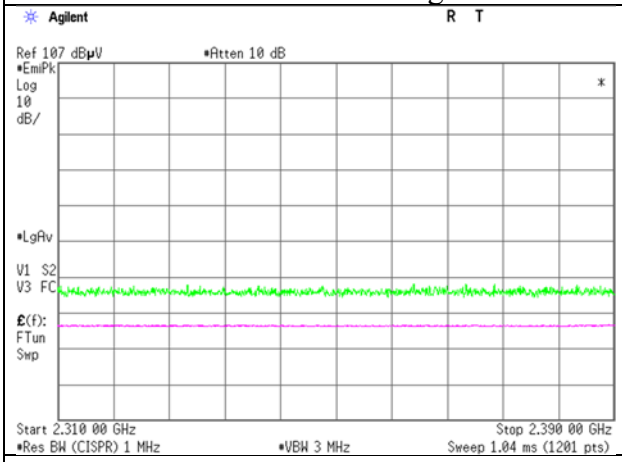
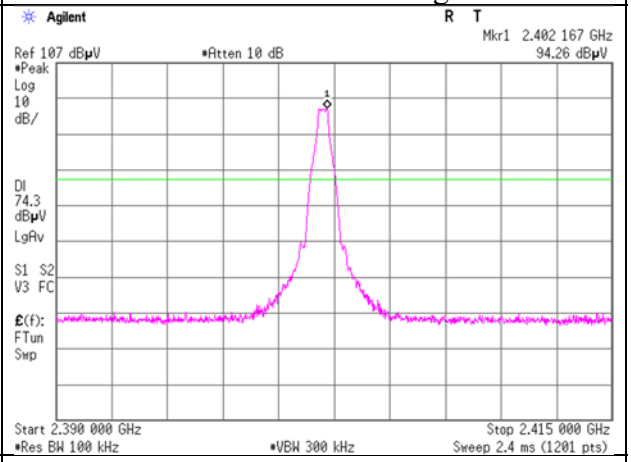
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

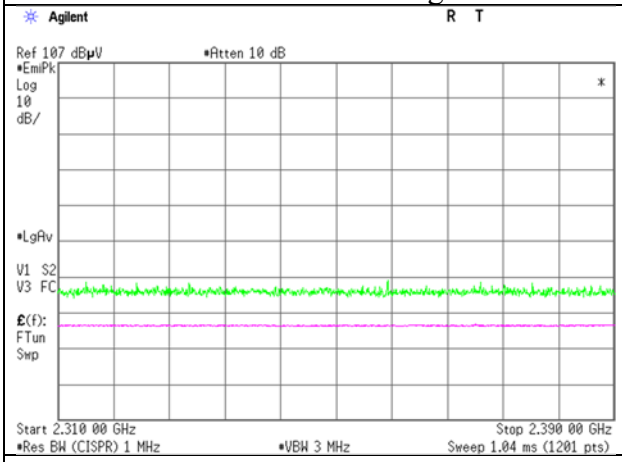
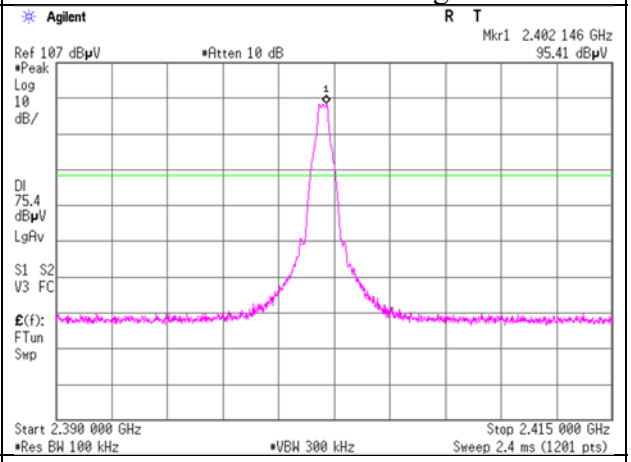
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.95	28.55	14.21	38.80	2.46	101.37	-	-	Carrier
Hori.	2400.000	PK	42.60	28.55	14.20	38.81	2.46	49.00	81.3	32.3	-
Vert.	2402.000	PK	95.34	28.55	14.21	38.80	2.46	101.76	-	-	Carrier
Vert.	2400.000	PK	43.87	28.55	14.20	38.81	2.46	50.27	81.7	31.4	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 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.2
Date	December 10, 2022
Temperature / Humidity	20 deg.C, 33 %RH
Engineer	Shiro Kobayashi
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz, Right

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.2	No.1
Date	December 10, 2022	December 11, 2022	December 18, 2022
Temperature / Humidity	20 deg.C, 33 %RH	22 deg.C, 35 %RH	24 deg.C, 40 %RH
Engineer	Shiro Kobayashi	Akihiro Oda	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 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.	3661.658	PK	49.36	29.85	6.47	38.29	2.46	49.85	73.9	24.0	105	144	-
Hori.	4882.000	PK	45.17	31.92	7.05	38.68	2.46	47.92	73.9	25.9	135	155	-
Hori.	7323.000	PK	44.64	37.67	8.50	39.28	2.46	53.99	73.9	19.9	112	92	-
Hori.	3661.658	AV	42.79	29.85	6.47	38.29	2.46	43.28	53.9	**10.6**	105	144	VBW: 360 Hz
Hori.	4882.000	AV	34.05	31.92	7.05	38.68	2.46	36.80	53.9	17.1	135	155	VBW: 360 Hz
Hori.	7323.000	AV	32.93	37.67	8.50	39.28	2.46	42.28	53.9	11.6	112	92	VBW: 360 Hz
Vert.	3661.588	PK	50.03	29.85	6.47	38.29	2.46	50.52	73.9	23.3	100	0	-
Vert.	4882.000	PK	44.05	31.92	7.05	38.68	2.46	46.80	73.9	27.1	155	278	-
Vert.	7323.000	PK	45.50	37.67	8.50	39.28	2.46	54.85	73.9	19.0	140	274	-
Vert.	3661.588	AV	42.00	29.85	6.47	38.29	2.46	42.49	53.9	11.4	100	0	VBW: 360 Hz
Vert.	4882.000	AV	34.38	31.92	7.05	38.68	2.46	37.13	53.9	16.7	155	278	VBW: 360 Hz
Vert.	7323.000	AV	33.78	37.67	8.50	39.28	2.46	43.13	53.9	10.7	140	274	VBW: 360 Hz

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

Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

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

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.1
Date	December 10, 2022	December 11, 2022	December 18, 2022
Temperature / Humidity	20 deg.C, 33 %RH	22 deg.C, 35 %RH	24 deg.C, 40 %RH
Engineer	Shiro Kobayashi	Akihiro Oda	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 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	52.09	28.44	14.29	38.76	2.46	58.52	73.9	15.3	111	34	-
Hori.	3719.987	PK	48.45	29.97	6.48	38.29	2.46	49.07	73.9	24.8	100	143	-
Hori.	4960.000	PK	44.72	32.10	7.09	38.72	2.46	47.65	73.9	26.2	100	4	-
Hori.	7440.000	PK	44.82	37.82	8.58	39.33	2.46	54.35	73.9	19.5	134	94	-
Hori.	2483.500	AV	34.47	28.44	14.29	38.76	2.46	40.90	53.9	13.0	111	34	VBW: 360 Hz
Hori.	3719.987	AV	41.84	29.97	6.48	38.29	2.46	42.46	53.9	11.4	100	143	VBW: 360 Hz
Hori.	4960.000	AV	33.43	32.10	7.09	38.72	2.46	36.36	53.9	17.5	100	4	VBW: 360 Hz
Hori.	7440.000	AV	33.28	37.82	8.58	39.33	2.46	42.81	53.9	11.0	134	94	VBW: 360 Hz
Vert.	2483.500	PK	51.17	28.44	14.29	38.76	2.46	57.60	73.9	16.3	156	27	-
Vert.	3720.001	PK	46.76	29.97	6.48	38.29	2.46	47.38	73.9	26.5	100	199	-
Vert.	4960.000	PK	44.70	32.10	7.09	38.72	2.46	47.63	73.9	26.2	100	0	-
Vert.	7440.000	PK	45.53	37.82	8.58	39.33	2.46	55.06	73.9	18.8	142	281	-
Vert.	2483.500	AV	34.32	28.44	14.29	38.76	2.46	40.75	53.9	13.1	156	27	VBW: 360 Hz
Vert.	3720.001	AV	41.93	29.97	6.48	38.29	2.46	42.55	53.9	11.3	100	199	VBW: 360 Hz
Vert.	4960.000	AV	33.18	32.10	7.09	38.72	2.46	36.11	53.9	17.7	100	0	VBW: 360 Hz
Vert.	7440.000	AV	33.95	37.82	8.58	39.33	2.46	43.48	53.9	**10.4**	142	281	VBW: 360 Hz

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

Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

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

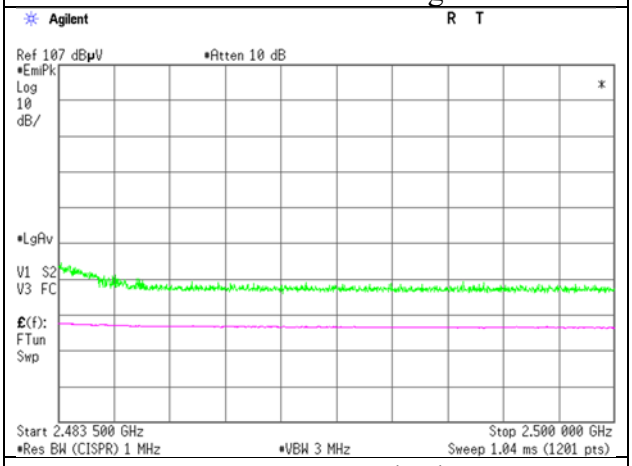
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	December 10, 2022
Temperature / Humidity	20 deg.C, 33 %RH
Engineer	Shiro Kobayashi
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz, Right

Horizontal

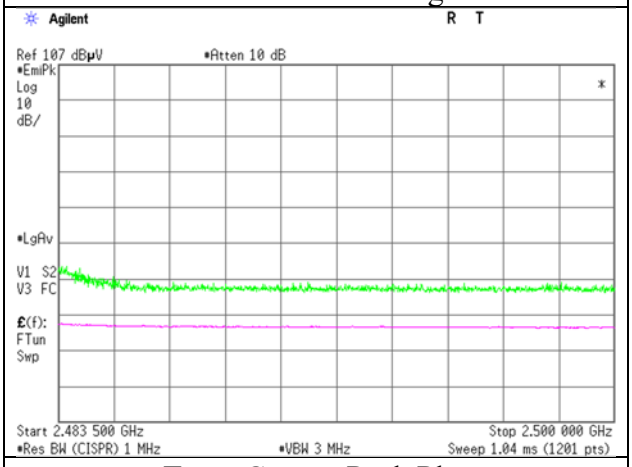
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.2	No.1
Date	December 10, 2022	December 11, 2022	December 18, 2022
Temperature / Humidity	20 deg.C, 33 %RH	22 deg.C, 35 %RH	24 deg.C, 40 %RH
Engineer	Shiro Kobayashi	Akihiro Oda	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 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	46.50	28.57	14.19	38.81	2.46	52.91	73.9	20.9	114	27	-
Hori.	3603.055	PK	48.87	29.71	6.43	38.28	2.46	49.19	73.9	24.7	104	138	-
Hori.	4804.000	PK	46.67	31.90	7.00	38.64	2.46	49.39	73.9	24.5	102	42	-
Hori.	7206.000	PK	45.79	37.57	8.40	39.24	2.46	54.98	73.9	18.9	103	146	-
Hori.	2390.000	AV	33.62	28.57	14.19	38.81	2.46	40.03	53.9	13.8	114	27	VBW: 360 Hz
Hori.	3603.055	AV	39.85	29.71	6.43	38.28	2.46	40.17	53.9	13.7	104	138	VBW: 360 Hz
Hori.	4804.000	AV	33.42	31.90	7.00	38.64	2.46	36.14	53.9	17.7	102	42	VBW: 360 Hz
Hori.	7206.000	AV	34.59	37.57	8.40	39.24	2.46	43.78	53.9	**10.1**	103	146	VBW: 360 Hz
Vert.	2390.000	PK	46.70	28.57	14.19	38.81	2.46	53.11	73.9	20.7	137	39	-
Vert.	3603.022	PK	47.98	29.71	6.43	38.28	2.46	48.30	73.9	25.6	100	5	-
Vert.	4804.000	PK	44.59	31.90	7.00	38.64	2.46	47.31	73.9	26.5	100	23	-
Vert.	7206.000	PK	45.37	37.57	8.40	39.24	2.46	54.56	73.9	19.3	145	0	-
Vert.	2390.000	AV	33.57	28.57	14.19	38.81	2.46	39.98	53.9	13.9	137	39	VBW: 360 Hz
Vert.	3603.022	AV	38.75	29.71	6.43	38.28	2.46	39.07	53.9	14.8	100	5	VBW: 360 Hz
Vert.	4804.000	AV	33.47	31.90	7.00	38.64	2.46	36.19	53.9	17.7	100	23	VBW: 360 Hz
Vert.	7206.000	AV	34.11	37.57	8.40	39.24	2.46	43.30	53.9	10.6	145	0	VBW: 360 Hz

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

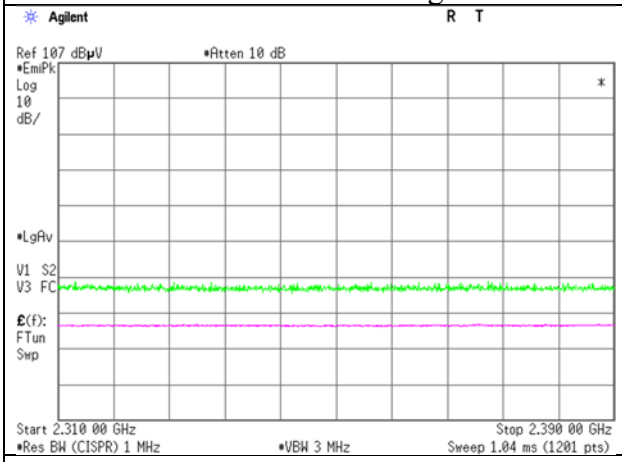
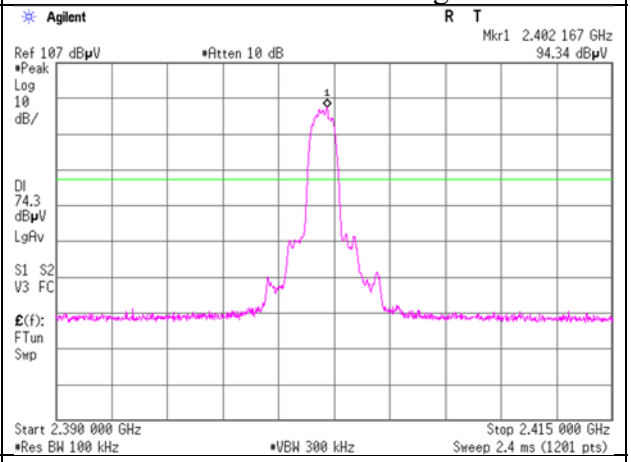
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

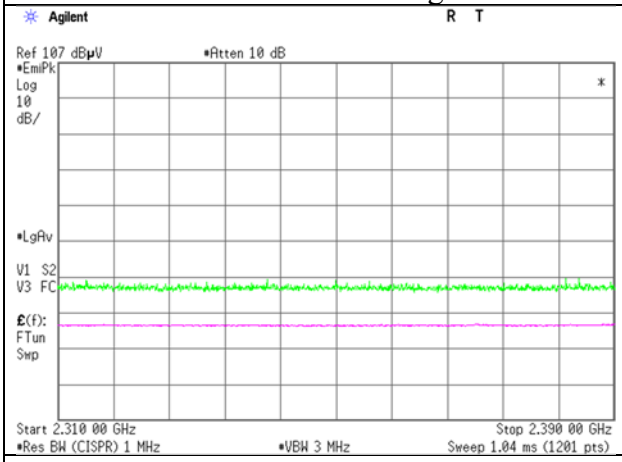
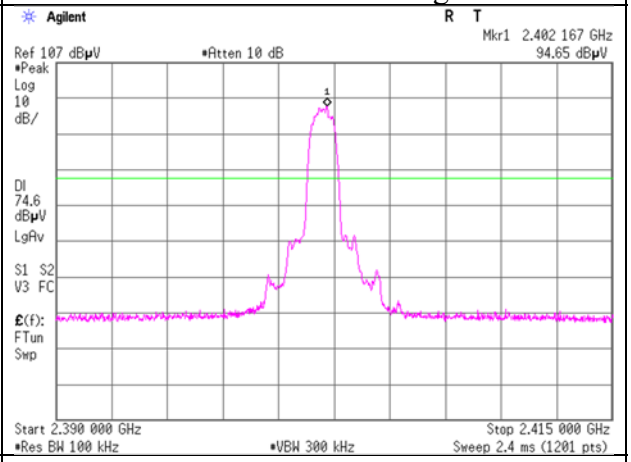
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.55	28.55	14.21	38.80	2.46	100.97	-	-	Carrier
Hori.	2399.542	PK	46.88	28.55	14.20	38.81	2.46	53.28	80.9	27.6	-
Hori.	2400.000	PK	44.44	28.55	14.20	38.81	2.46	50.84	80.9	30.0	-
Vert.	2402.000	PK	94.66	28.55	14.21	38.80	2.46	101.08	-	-	Carrier
Vert.	2399.517	PK	47.28	28.55	14.20	38.81	2.46	53.68	81.0	27.3	-
Vert.	2400.000	PK	44.85	28.55	14.20	38.81	2.46	51.25	81.0	29.7	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 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.2
Date	December 10, 2022
Temperature / Humidity	20 deg.C, 33 %RH
Engineer	Shiro Kobayashi
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz, Right

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.2	No.1
Date	December 10, 2022	December 11, 2022	December 18, 2022
Temperature / Humidity	20 deg.C, 33 %RH	22 deg.C, 35 %RH	24 deg.C, 40 %RH
Engineer	Shiro Kobayashi	Akihiro Oda	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 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.	3661.473	PK	48.87	29.85	6.47	38.29	2.46	49.36	73.9	24.5	119	146	-
Hori.	4882.000	PK	44.18	31.92	7.05	38.68	2.46	46.93	73.9	26.9	100	8	-
Hori.	7323.000	PK	44.65	37.67	8.50	39.28	2.46	54.00	73.9	19.9	123	11	-
Hori.	3661.473	AV	40.09	29.85	6.47	38.29	2.46	40.58	53.9	13.3	119	146	VBW: 360 Hz
Hori.	4882.000	AV	33.25	31.92	7.05	38.68	2.46	36.00	53.9	17.9	100	8	VBW: 360 Hz
Hori.	7323.000	AV	33.50	37.67	8.50	39.28	2.46	42.85	53.9	**11.0**	123	11	VBW: 360 Hz
Vert.	3661.507	PK	48.32	29.85	6.47	38.29	2.46	48.81	73.9	25.0	177	179	-
Vert.	4882.000	PK	45.95	31.92	7.05	38.68	2.46	48.70	73.9	25.2	100	115	-
Vert.	7323.000	PK	45.25	37.67	8.50	39.28	2.46	54.60	73.9	19.3	124	109	-
Vert.	3661.507	AV	38.66	29.85	6.47	38.29	2.46	39.15	53.9	14.7	177	179	VBW: 360 Hz
Vert.	4882.000	AV	34.25	31.92	7.05	38.68	2.46	37.00	53.9	16.9	100	115	VBW: 360 Hz
Vert.	7323.000	AV	33.49	37.67	8.50	39.28	2.46	42.84	53.9	**11.0**	124	109	VBW: 360 Hz

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

Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

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

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.1	No.2	No.2	No.1
Date	December 20, 2022	December 10, 2022	December 11, 2022	December 18, 2022
Temperature / Humidity	21 deg.C, 25 %RH	20 deg.C, 33 %RH	22 deg.C, 35 %RH	24 deg.C, 40 %RH
Engineer	Miku Ikudome	Shiro Kobayashi	Akihiro Oda	Hiromasa Sato
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 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.	198.854	QP	22.77	16.72	9.22	31.77	0.00	16.94	43.5	26.5	150	0	-
Hori.	512.503	QP	22.90	17.79	7.97	31.93	0.00	16.73	46.0	29.2	150	0	-
Hori.	914.708	QP	22.78	22.11	10.04	31.25	0.00	23.68	46.0	22.3	150	0	-
Hori.	2483.500	PK	50.87	28.44	14.29	38.76	2.46	57.30	73.9	16.6	111	34	-
Hori.	3720.067	PK	48.39	29.97	6.48	38.29	2.46	49.01	73.9	24.8	127	144	-
Hori.	4960.000	PK	45.03	32.10	7.09	38.72	2.46	47.96	73.9	25.9	108	15	-
Hori.	7440.000	PK	45.20	37.82	8.58	39.33	2.46	54.73	73.9	19.1	106	0	-
Hori.	2483.500	AV	34.92	28.44	14.29	38.76	2.46	41.35	53.9	12.5	111	34	VBW: 360 Hz
Hori.	3720.067	AV	39.40	29.97	6.48	38.29	2.46	40.02	53.9	13.8	127	144	VBW: 360 Hz
Hori.	4960.000	AV	33.14	32.10	7.09	38.72	2.46	36.07	53.9	17.8	108	15	VBW: 360 Hz
Hori.	7440.000	AV	33.49	37.82	8.58	39.33	2.46	43.02	53.9	**10.8**	106	0	VBW: 360 Hz
Vert.	71.600	QP	22.05	6.48	7.81	31.82	0.00	4.52	40.0	35.4	285	213	-
Vert.	74.371	QP	23.24	6.36	7.85	31.82	0.00	5.63	40.0	34.3	230	223	-
Vert.	172.225	QP	22.96	15.80	8.96	31.78	0.00	15.94	43.5	27.5	150	0	-
Vert.	940.011	QP	22.85	22.11	10.14	31.11	0.00	23.99	46.0	22.0	150	0	-
Vert.	2483.500	PK	51.22	28.44	14.29	38.76	2.46	57.65	73.9	16.2	157	31	-
Vert.	3720.128	PK	46.80	29.97	6.48	38.29	2.46	47.42	73.9	26.4	161	172	-
Vert.	4960.000	PK	44.93	32.10	7.09	38.72	2.46	47.86	73.9	26.0	100	133	-
Vert.	7440.000	PK	45.55	37.82	8.58	39.33	2.46	55.08	73.9	18.8	133	92	-
Vert.	2483.500	AV	34.86	28.44	14.29	38.76	2.46	41.29	53.9	12.6	157	31	VBW: 360 Hz
Vert.	3720.128	AV	38.72	29.97	6.48	38.29	2.46	39.34	53.9	14.5	161	172	VBW: 360 Hz
Vert.	4960.000	AV	33.52	32.10	7.09	38.72	2.46	36.45	53.9	17.4	100	133	VBW: 360 Hz
Vert.	7440.000	AV	33.31	37.82	8.58	39.33	2.46	42.84	53.9	11.0	133	92	VBW: 360 Hz

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

Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

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

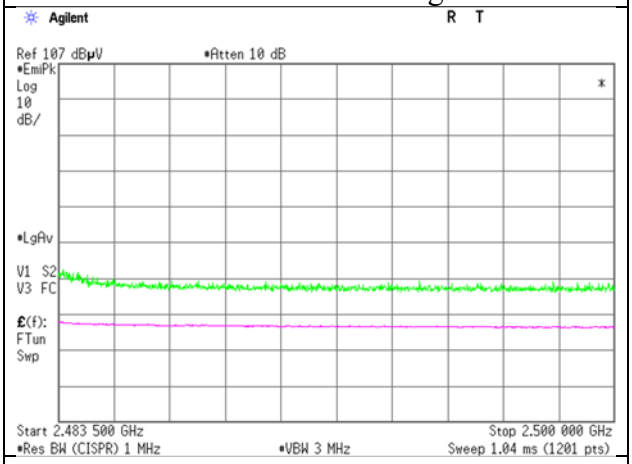
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	December 10, 2022
Temperature / Humidity	20 deg.C, 33 %RH
Engineer	Shiro Kobayashi
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz, Right

Horizontal

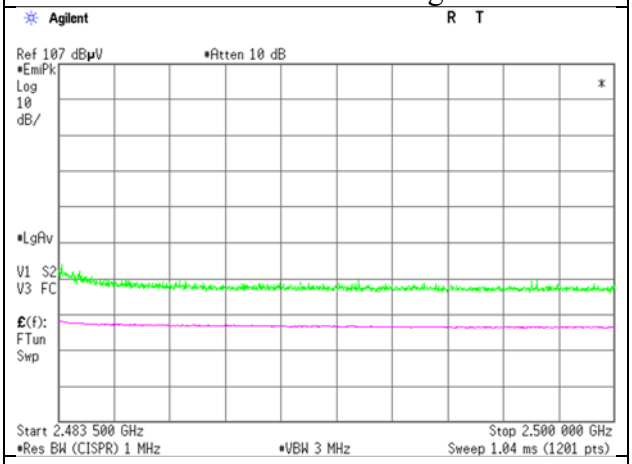
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

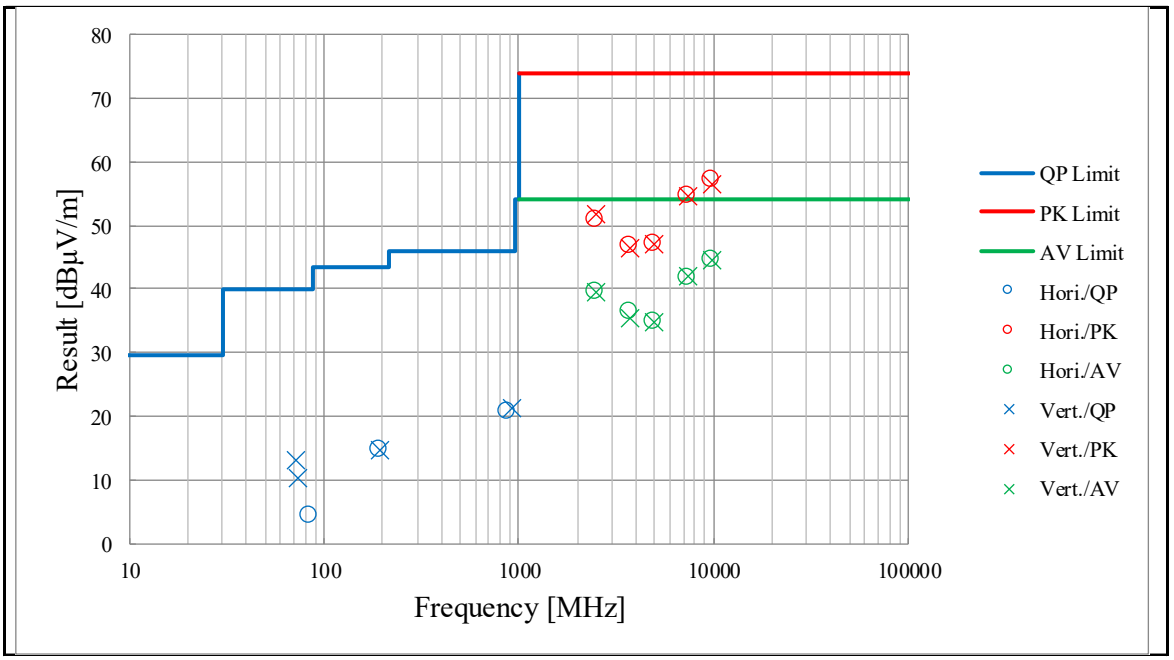


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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)

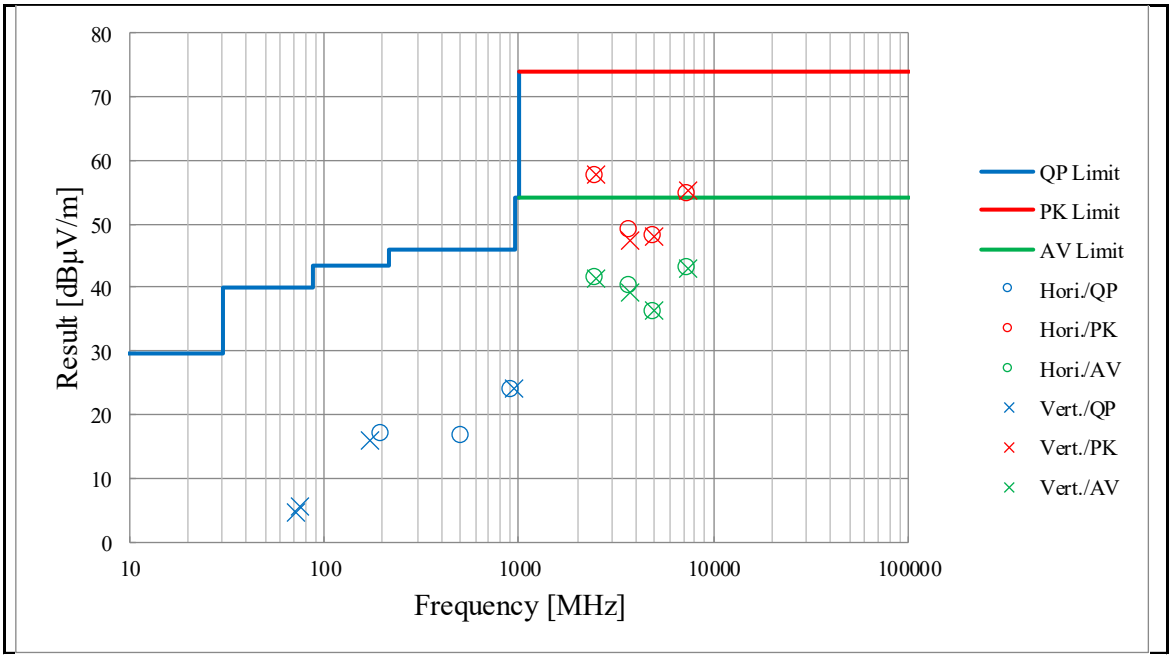
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.2	No.2	No.1	No.1
Date	December 19, 2022	December 11, 2022	December 16, 2022	December 18, 2022
Temperature / Humidity	20 deg.C, 27 %RH	22 deg.C, 35 %RH	22 deg.C, 37 %RH	24 deg.C, 40 %RH
Engineer	Miku Ikudome	Akihiro Oda	Hiromasa Sato	Hiromasa Sato
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 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.1	No.2	No.2	No.1
Date	December 20, 2022	December 10, 2022	December 11, 2022	December 18, 2022
Temperature / Humidity	21 deg.C, 25 %RH	20 deg.C, 33 %RH	22 deg.C, 35 %RH	24 deg.C, 40 %RH
Engineer	Miku Ikudome	Shiro Kobayashi	Akihiro Oda	Hiromasa Sato
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz, Right			



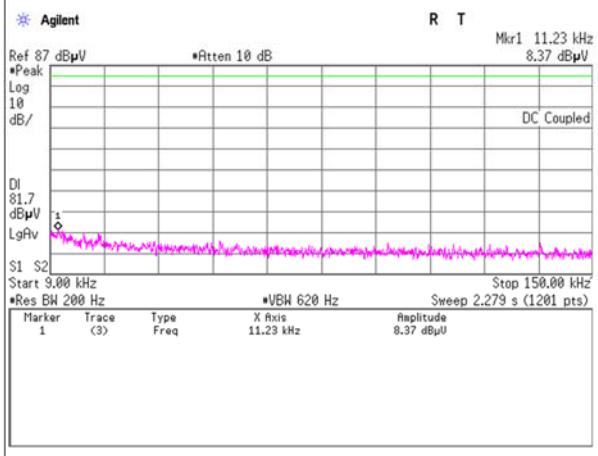
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

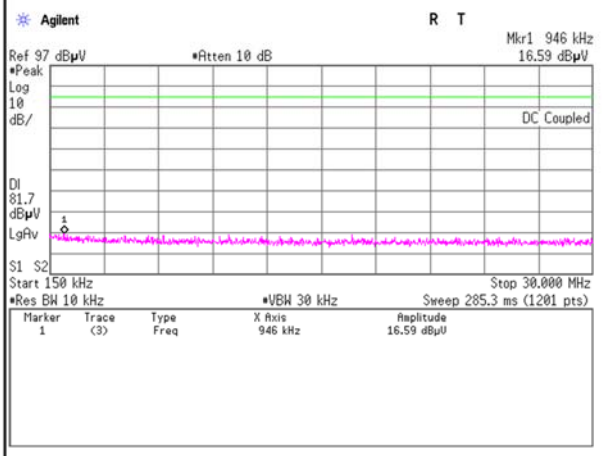
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off, DH5

2402 MHz

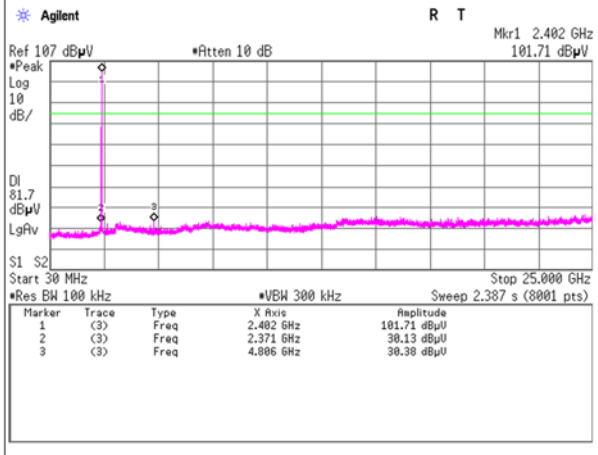
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

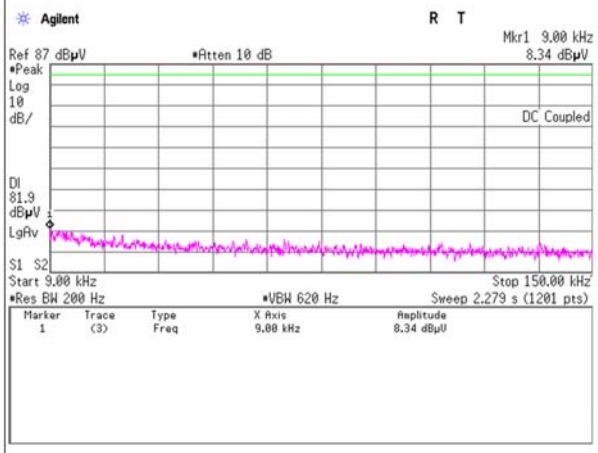


Conducted Spurious Emission

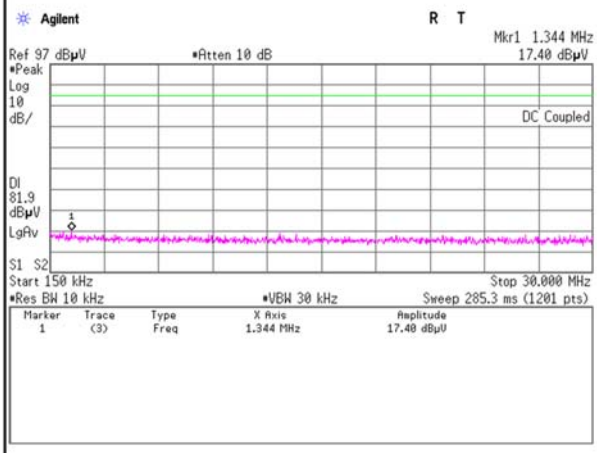
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off, DH5

2441 MHz

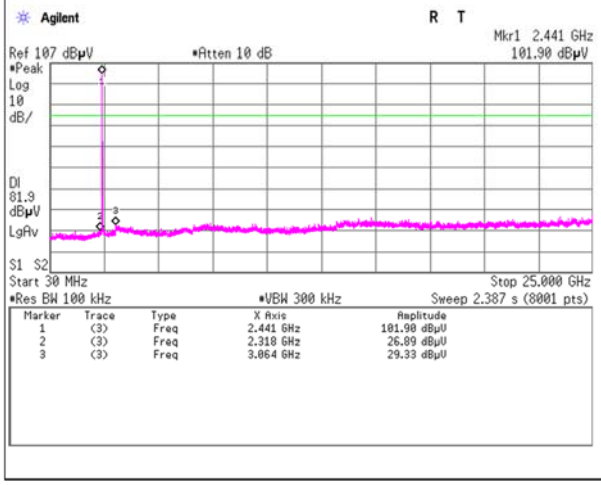
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

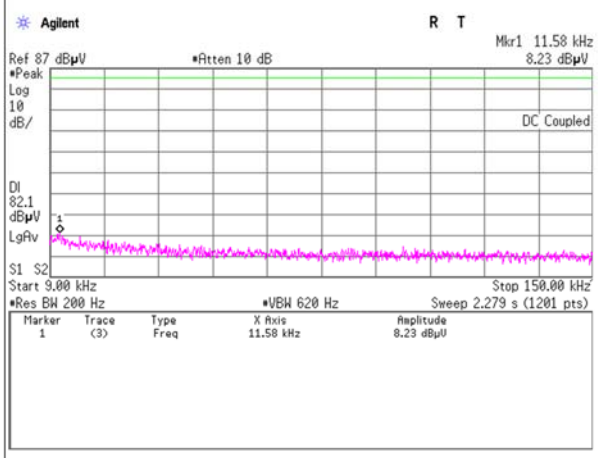


Conducted Spurious Emission

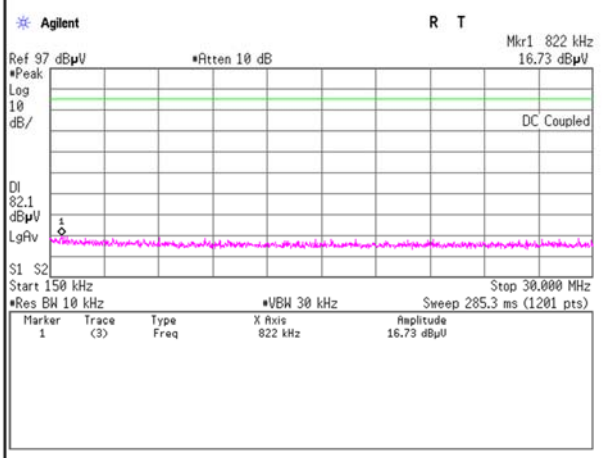
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off, DH5

2480 MHz

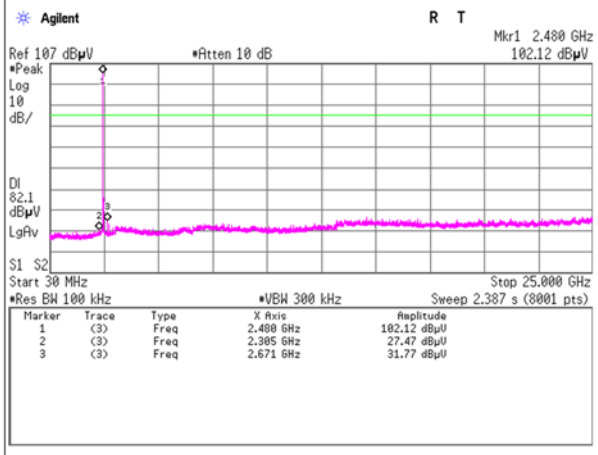
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

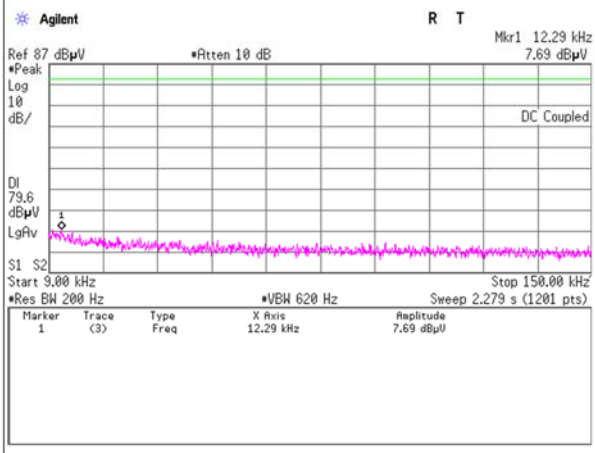


Conducted Spurious Emission

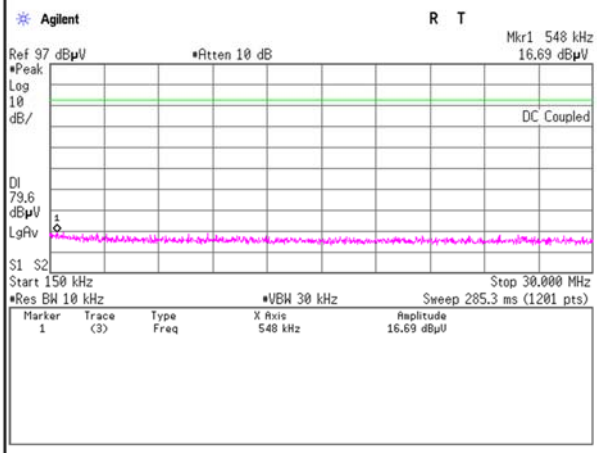
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off, 3DH5

2402 MHz

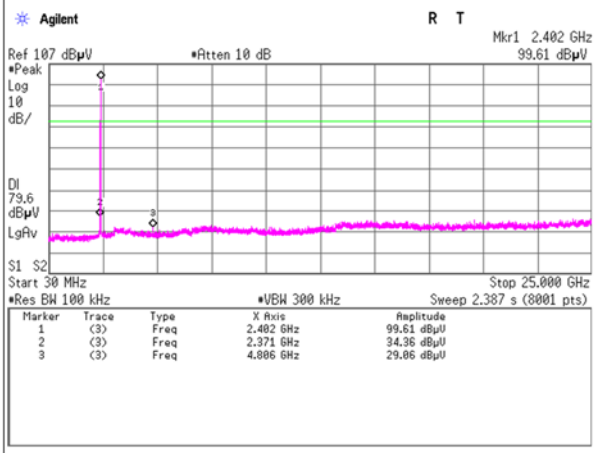
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

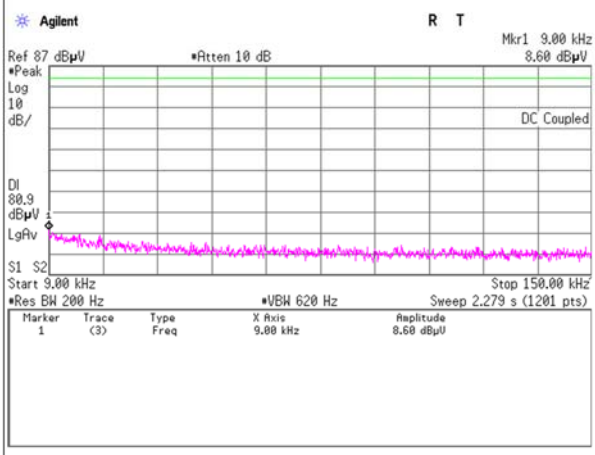


Conducted Spurious Emission

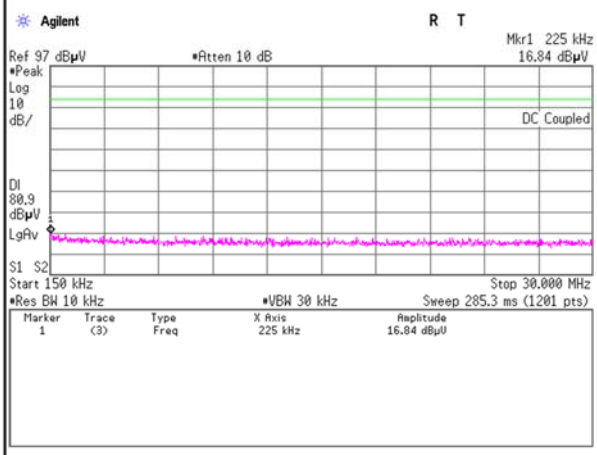
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off, 3DH5

2441 MHz

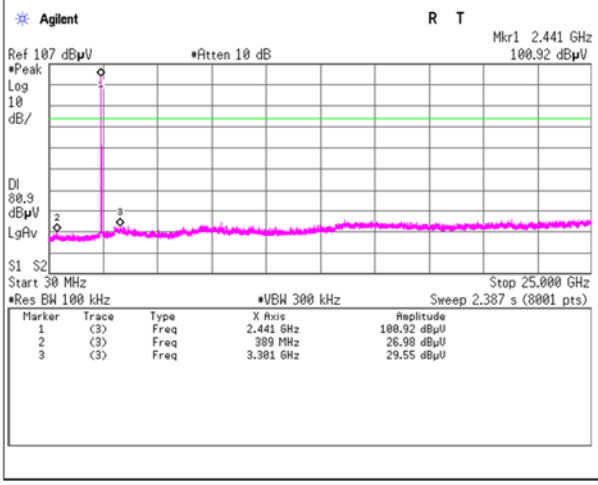
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

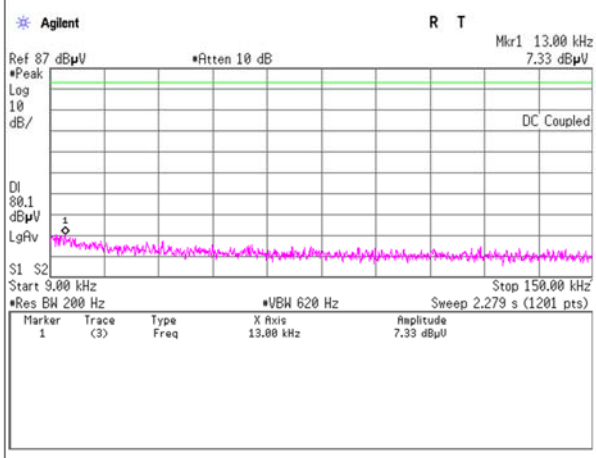


Conducted Spurious Emission

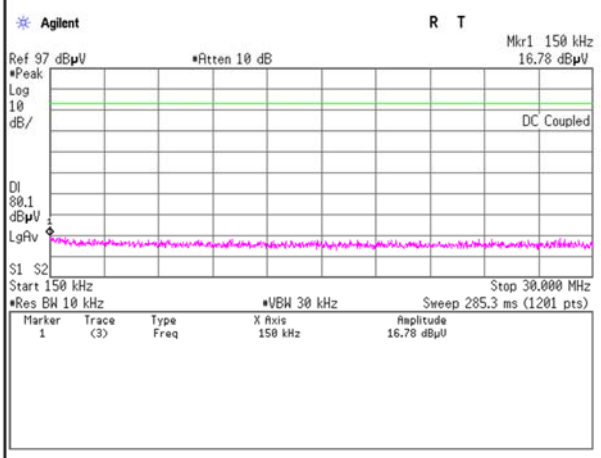
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx, Hopping Off, 3DH5

2480 MHz

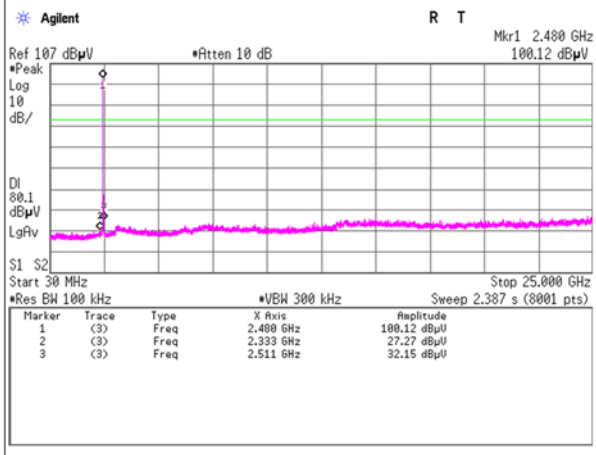
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

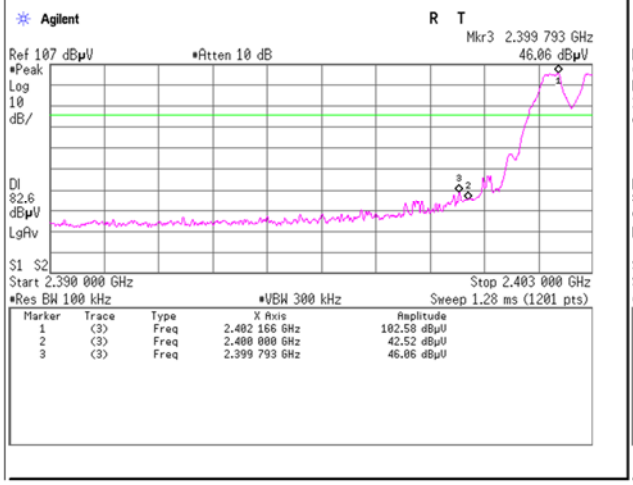


Conducted Emission Band Edge compliance

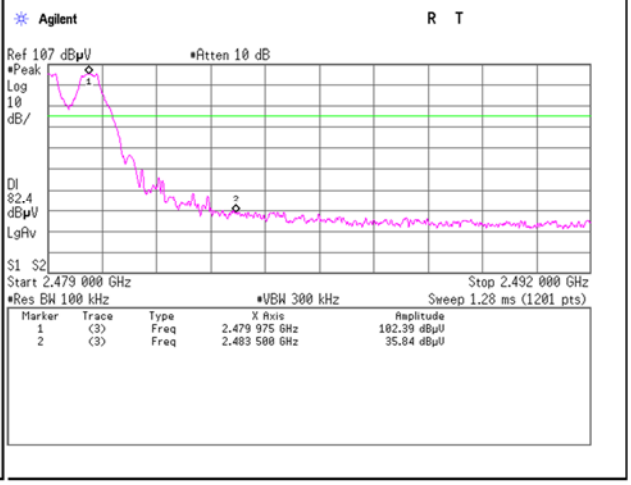
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx DH5

Hopping On

Low

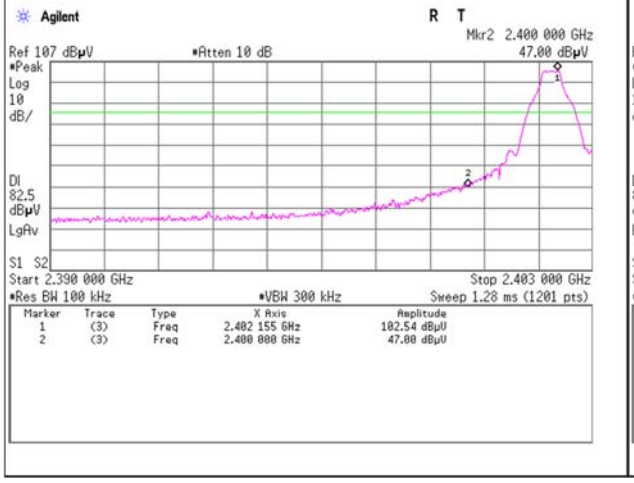


High

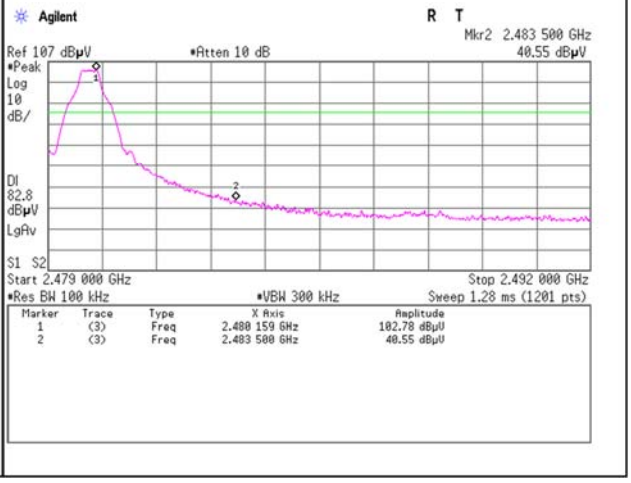


Hopping Off

Low



High

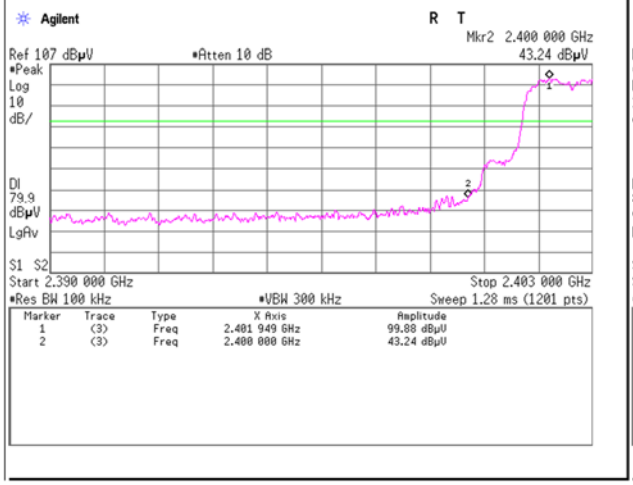


Conducted Emission Band Edge compliance

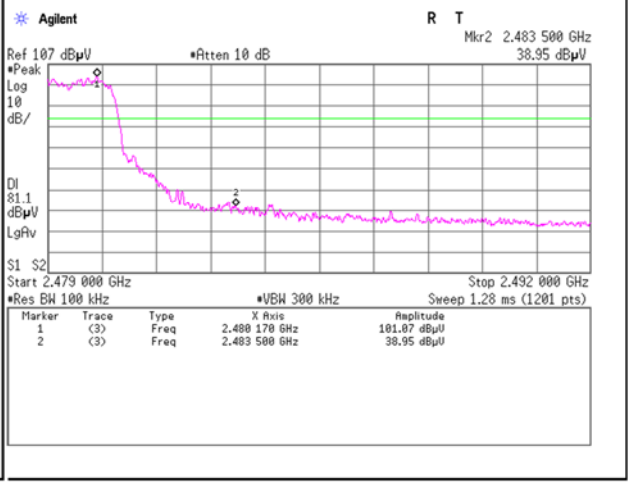
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	December 2, 2022
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx 3DH5

Hopping On

Low

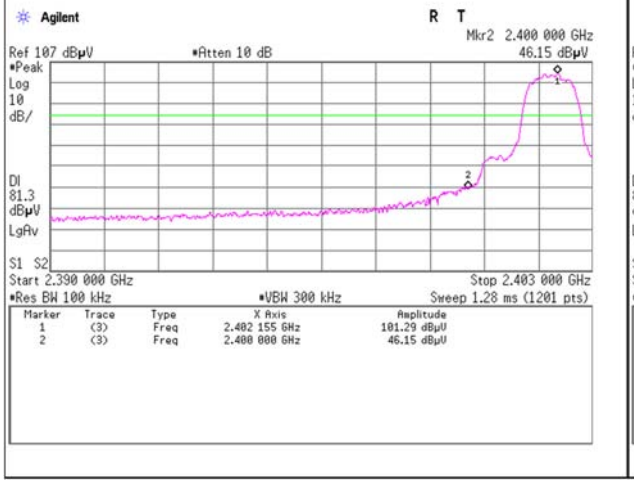


High

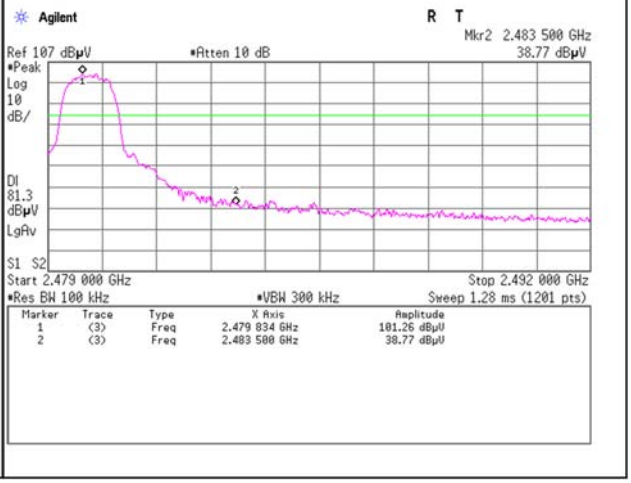


Hopping Off

Low



High



APPENDIX 2: Test Instruments

Test Equipment(1/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	KTS-08	145095	Digital Tester	SANWA	PC500	7019224	2022/04/07	12
AT	SAT10-12	151609	Attenuator	Weinschel Corp.	54A-10	81601	2022/03/02	12
AT	SCC-G66	196947	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803478/2	2022/03/02	12
AT	SOS-28	191846	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	SRENT-09	150461	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186392	2022/03/14	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE, ME,PE)	-	-	-
RE	KAT6-04	144899	Attenuator	Inmet	18N-6dB	-	2021/12/10	12
RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2022/11/01	12
RE	SAEC-01(NSA)	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2022/04/11	12
RE	SAEC-01(SVSWR)	145561	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	2022/05/13	12
RE	SAEC-02(NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2022/03/20	12
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2022/05/16	12
RE	SAF-01	145003	Pre Amplifier	SONOMA	310N	290211	2022/02/24	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2022/02/24	12
RE	SAF-04	145127	Pre Amplifier	Toyo Corporation	TPA0118-36	2072554	2022/05/20	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2022/05/12	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2022/03/03	12
RE	SAT10-05	145136	Attenuator	Keysight Technologies Inc	8493C-010	74864	2022/10/20	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2022/10/20	12
RE	SAT3-09	144959	Attenuator	JFW	50HF-003N	-	2022/08/23	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-01	145161	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032664	2022/04/16	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032665	2022/04/16	12
RE	SCC-A1/A3/A5/A7/A8/A13/SRSE-01	144967	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2022/04/20	12
RE	SCC-A2/A4/A6/A7/A8/A13/SRSE-01	144968	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2022/04/20	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/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/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	2022/04/20	12

Test Equipment(2/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SCC-G05	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2022/01/06	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNM S/B	1612S005	2022/01/06	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNM S/B	1612S006	2022/01/06	12
RE	SCC-G45	168301	Coaxial Cable	Huber+Suhner	SUCOFLEX 102 E	800137/2EA	2022/03/03	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-G62	196985	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803650/2	2022/03/08	12
RE	SCC-G68	200008	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575616/4	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-01	145383	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-725	2022/03/01	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-726	2022/03/10	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2022/06/06	12
RE	SHA-08	194683	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	694	2022/03/01	12
RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-
RE	SJM-22	207279	Measuring Tool, Tape Measure	ASKUL	-	-	-	-
RE	SLA-05	145527	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	193	2022/04/16	12
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2022/04/16	12
RE	SOS-20	191837	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/06	12
RE	SOS-21	191838	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
RE	STR-01	145790	Test Receiver	Rohde & Schwarz	ESU40	100093	2022/04/28	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2022/03/02	12
RE	STS-01	145792	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997812	2022/09/20	12
RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2022/04/07	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