RADIO TEST REPORT

Test Report No. 14344153S-B-R2

Customer	**JVCKENWOOD Corporation**
Description of EUT	**Monitor with Receiver**
Model Number of EUT	**DMX809S**
FCC ID	**IOMJ5284**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**September 21, 2022**
Remarks	**Bluetooth (BR / EDR) parts**

Representative Test Engineer	**Approved By**
Shiro Kobayashi Engineer	Kazuya Noda Leader

CERTIFICATE 1266.03

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REVISION HISTORY

Original Test Report No.: 14344153S-B

This report is a revised version of 14344153S-B-R1. 14344153S-B-R1 is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14344153S-B	August 24, 2022	-
1	14344153S-B-R1	September 13, 2022	P.6 Correction of antenna gain of Bluetooth (BR / EDR) From: -6.0 dBi To: -12.3dBi
			P.27 Data replacement by correction of antenna gain of Bluetooth (BR / EDR)
2	14344153S-B-R2	September 21, 2022	P.7 Correction of worst margin of Spurious Emission From: 7.7 dB To: 7.8 dB

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	JVCKENWOOD Corporation
Address	2967-3, Ishikawa-machi, Hachioji, Tokyo 192-8525 Japan
Telephone Number	+81-42-646-5525
Contact Person	Seigo Tsutsumi

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	Monitor with Receiver
Model Number	DMX809S
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	July 22, 2022
Test Date	July 24 to 26, 2022

2.2 Product Description

The EUT has following similar model:

Model No.	Difference from the base model
DMX809S	- (Tested model)
DMX8709S	Non HD Radio
KW-M785BW	Brand(JVC), Non HD Radio

General Specification

Rating	DC 12 V
Operating temperature	-10 deg. C to +60 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	-12.3 dBi

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
Antenna Gain	-9.4 dBi

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

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5745 MHz to 5805 MHz
	40 MHz Band:	5755 MHz to 5795 MHz
	80 MHz Band:	5775 MHz
Type of Modulation	OFDM	
Antenna Gain	ANT0: 1.1 dBi, ANT1: 0.1 dBi	

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C FCC Part 15 final revised on April 1, 2022 and effective May 2, 2022
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

*The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods **ISED:** RSS-Gen 8.8	**FCC:** Section 15.207 **ISED:** RSS-Gen 8.8	-	N/A	*1)
Carrier Frequency Separation	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** -	**FCC:** Section15.247(a)(1) **ISED:** RSS-247 5.1 (b)	See data.	Complied a)	Conducted
20 dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** -	**FCC:** Section15.247(a)(1) **ISED:** RSS-247 5.1 (a)		Complied aa)	Conducted
Number of Hopping Frequency	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** -	**FCC:** Section15.247(a)(1)(iii) **ISED:** RSS-247 5.1 (d)		Complied b)	Conducted
Dwell time	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** -	**FCC:** Section15.247(a)(1)(iii) **ISED:** RSS-247 5.1 (d)		Complied c)	Conducted
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** RSS-Gen 6.12	**FCC:** Section15.247(a)(b)(1) **ISED:** RSS-247 5.4 (b)		Complied d)	Conducted
Spurious Emission & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02 **ISED:** RSS-Gen 6.13	**FCC:** Section15.247(d) **ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.8 dB 223.761 MHz, QP, Hori. Mode: 3DH5 2441 MHz with 11n-20 MIMO 5745 MHz	Complied e) / f)	Conducted/ Radiated (above 30 MHz) *2)

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 does not have AC Mains.
*2) Radiated test was selected over 30 MHz based on section 15.247(d).

a) Refer to APPENDIX 1 (data of 20 dB 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)

Symbols:
Complied The data of this test item has enough margin, more than the measurement uncertainty.
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

FCC Part 15.31 (e)

The EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.
Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the 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 20 dB 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

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

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

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz to 30 MHz	2.9 dB	2.9 dB	3.0 dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz to 30 MHz	3.2 dB	3.1 dB	3.1 dB	-
	30 MHz to 200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz to 1 GHz	6.0 dB	6.1 dB	6.1 dB	-
	1 GHz to 6 GHz	4.7 dB	4.7 dB	4.7 dB	-
	6 GHz to 18 GHz	5.2 dB	5.3 dB	5.3 dB	-
	18 GHz to 40 GHz	5.4 dB	5.5 dB	5.5 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz to 18 GHz	5.6 dB	5.6 dB	5.6 dB	-
	18 GHz to 40 GHz	5.8 dB	5.8 dB	5.8 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector) SPM-06	1.2 dB
Power Measurement above 1 GHz (Peak Detector) SPM-06	2.0 dB
Power Measurement above 1 GHz (Average Detector) SPM-07	1.2 dB
Power Measurement above 1 GHz (Peak Detector) SPM-07	1.3 dB
Power Measurement above 1 GHz (Average Detector) SPM-13	1.3 dB
Power Measurement above 1 GHz (Peak Detector) SPM-13	1.3 dB
Spurious emission (Conducted) below 1 GHz	0.93 dB
Conducted emissions Power Density Measurement 1 GHz to 3 GHz	0.92 dB
Conducted emissions Power Density Measurement 3 GHz to 18 GHz	2.3 dB
Spurious emission (Conducted) 18 GHz to 26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz to 40 GHz	2.3 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %
Temperature_SCH-01	0.93 deg. C.
Humidity_SCH-01	4.1 %
Temperature_SCH-02	2.0 deg. C.
Humidity_SCH-02	6.6 %
Voltage	0.97 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 Japan
Telephone: +81 463 50 6400
A2LA Certificate Number: 1266.03
(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

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

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth (BT)	BR / EDR, Payload: PRBS9

*EUT has the power settings by the software as follows;
Power Setting: Fixed
Software: Application Version: V104.RF13
System Version: V107
(Date: 2022.07 22, 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.

Details of Operating Mode(s)

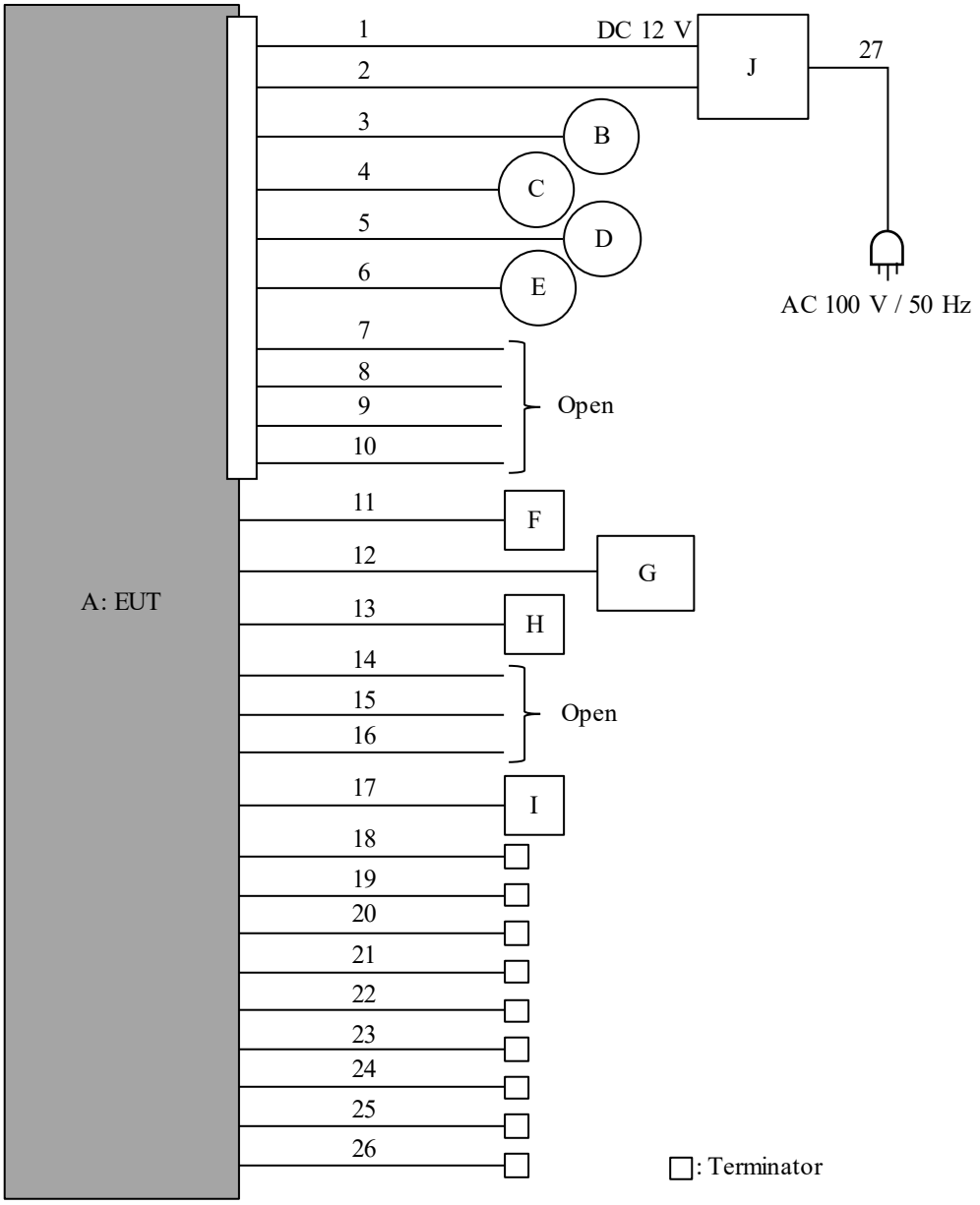
Test Item	Mode	Hopping	Tested Frequency
Radiated Spurious Emission (Below 1 GHz)	Tx 3DH5 *1)	Off	2441 MHz
Radiated Spurious Emission (Above 1 GHz)	Tx DH5 Tx 3DH5 Tx DH5 with 11n-20 MIMO 5745 MHz Tx 3DH5 with 11n-20 MIMO 5745 MHz	Off	2402 MHz 2441 MHz 2480 MHz
Conducted Spurious Emission	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx DH5 Tx 3DH5	On	2402 MHz 2441 MHz 2480 MHz
20 dB 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 (2 Mb/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) Radiated Spurious emissions (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

<For Radiated Emission test>



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

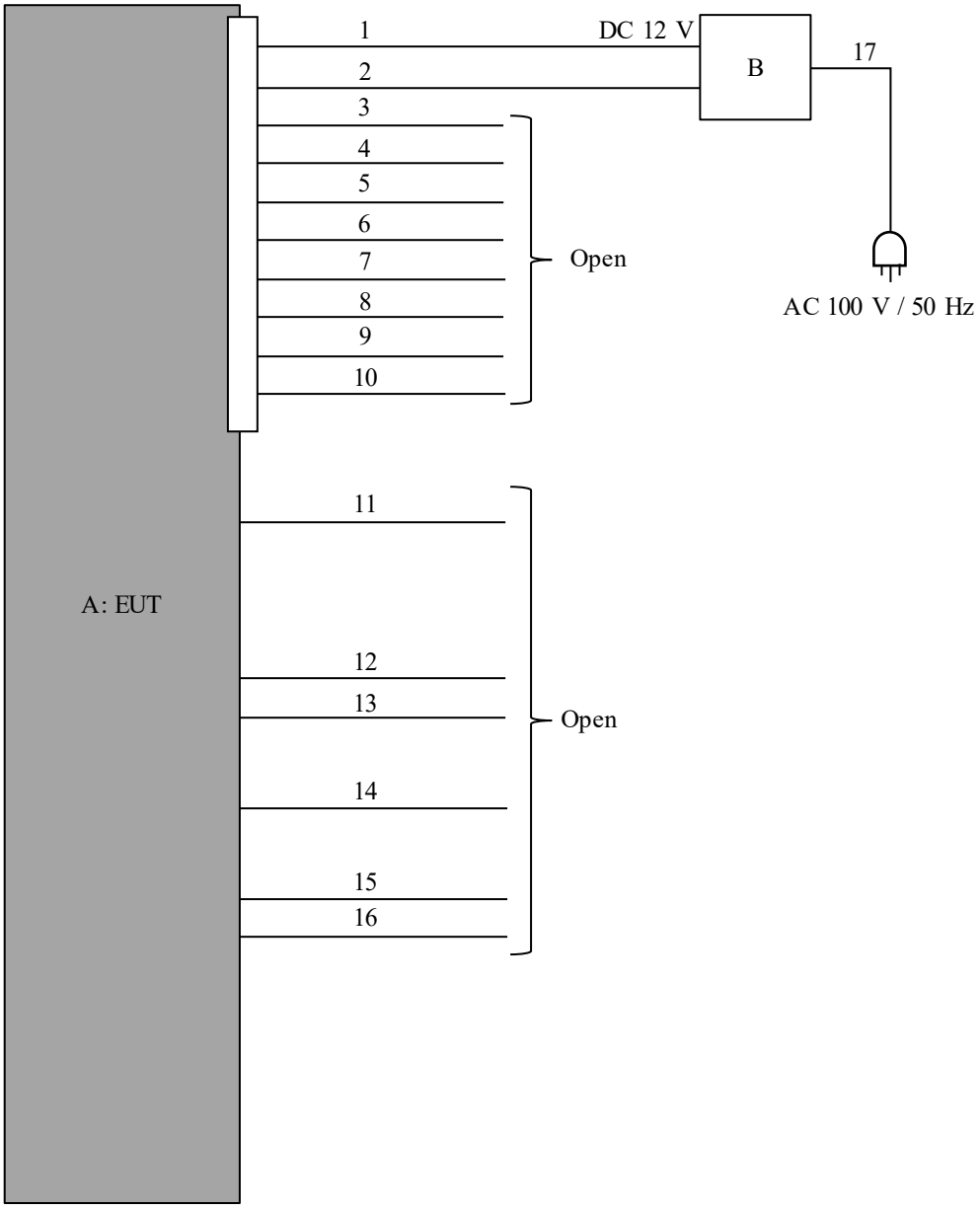
Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Monitor with Receiver	DMX809S	107X0061	JVCKENWOOD	EUT
B	Speaker	KFC-RS160	-	JVCKENWOOD	-
C	Speaker	KFC-RS160	-	JVCKENWOOD	-
D	Speaker	KFC-RS160	-	JVCKENWOOD	-
E	Speaker	KFC-RS160	-	JVCKENWOOD	-
F	USB Memory	SDDDC2-064G-G46	-	SanDisk	-
G	Handy Cam	HC-W585M	DM7LA002009	Panasonic	-
H	GPS ANTENNA	GPA-GS204	-	JVCKENWOOD	-
I	Microphone	GD-VHM4214A2	-	JVCKENWOOD	-
J	Power Supply (DC)	PAN35-10A	DE001677	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC (ACC, B+)	0.15 + 1.8	Unshielded	Unshielded	-
2	DC (GND)	0.15 + 1.8	Unshielded	Unshielded	-
3	Speaker (Front-L) +/-	0.15 + 2.0 + 1.9	Unshielded	Unshielded	-
4	Speaker (Front-R) +/-	0.15 + 2.0 + 1.9	Unshielded	Unshielded	-
5	Speaker (Rear-L) +/-	0.15 + 2.0 + 1.9	Unshielded	Unshielded	-
6	Speaker (Rear-R) +/-	0.15 + 2.0 + 1.9	Unshielded	Unshielded	-
7	ILLUMI	0.15 + 0.9	Unshielded	Unshielded	-
8	ANT Cont	0.15 + 0.9	Unshielded	Unshielded	-
9	Mute	0.15 + 0.9	Unshielded	Unshielded	-
10	REMOTE Cont	0.15 + 0.9	Unshielded	Unshielded	-
11	USB	1.0	Shielded	Shielded	-
12	HDMI	0.1 + 1.7	Shielded	Shielded	-
13	GPS	3.5	Shielded	Shielded	-
14	PRK SW	0.1 + 2.0	Unshielded	Unshielded	-
15	REVERSE	0.1 + 1.0	Unshielded	Unshielded	-
16	EXT IF	1.0	Shielded	Shielded	-
17	Mic	0.15 + 3.0	Shielded	Shielded	-
18	IF	1.0	Shielded	Shielded	-
19	FM/AM	0.15 + 1.8	Shielded	Shielded	-
20	Front View Camera	0.2 +1.5	Shielded	Shielded	-
21	Rear Preout	1.2	Shielded	Shielded	-
22	Front Preout	1.2	Shielded	Shielded	-
23	Subwoofer Preout	1.0	Shielded	Shielded	-
24	VIDEO OUT	3.6	Shielded	Shielded	-
25	R-CAM	2.1	Shielded	Shielded	-
26	AV-IN	1.4	Shielded	Shielded	-
27	AC	2.0	Unshielded	Unshielded	-

<For Antenna Terminal Conducted test>



Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Monitor with Receiver	DMX809S	107X0065	JVCKENWOOD	EUT
B	Power Supply(DC)	PAN35-10A	BP002287	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC (ACC, B+)	1.5	Unshielded	Unshielded	-
2	DC (GND)	1.5	Unshielded	Unshielded	-
3	Speaker (Front-L) +/-	0.15	Unshielded	Unshielded	-
4	Speaker (Front-R) +/-	0.15	Unshielded	Unshielded	-
5	Speaker (Rear-L) +/-	0.15	Unshielded	Unshielded	-
6	Speaker (Rear-R) +/-	0.15	Unshielded	Unshielded	-
7	ILLUMI	0.15	Unshielded	Unshielded	-
8	ANT Cont	0.15	Unshielded	Unshielded	-
9	Mute	0.15	Unshielded	Unshielded	-
10	REMOTE Cont	0.15	Unshielded	Unshielded	-
11	USB	1.0	Shielded	Shielded	-
12	PRK SW	0.1	Unshielded	Unshielded	-
13	REVERSE	0.1	Unshielded	Unshielded	-
14	Mic	0.15	Shielded	Shielded	-
15	FM/AM	0.15	Shielded	Shielded	-
16	Front View Camera	0.2	Shielded	Shielded	-
17	AC	2.0	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 2.0 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

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

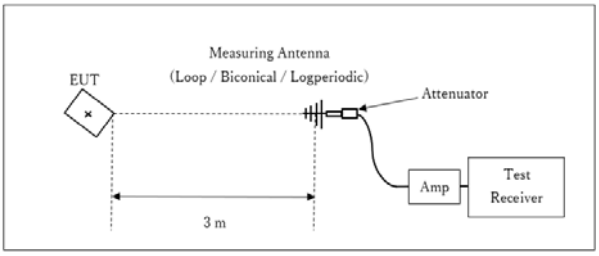
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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

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

Figure 2: Test Setup

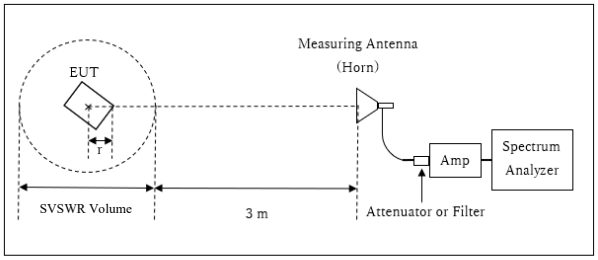
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

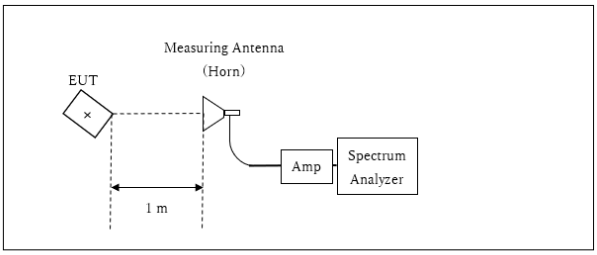


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.89 m / 3.0 m) = 2.26 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.89 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.11 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 0 deg and 30 deg 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	30 deg.	0 deg.	30 deg.	30 deg.	0 deg.	0 deg.
Vertical	30 deg.	0 deg.	30 deg.	30 deg.	0 deg.	0 deg.

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
20 dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 160 MHz BW)
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	Low 13 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
	High 10 MHz						

*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

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

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off, Tx, Hopping On

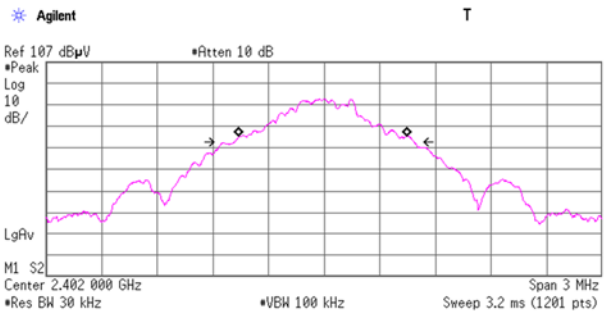
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.027	904.2	1.000	>= 0.685
DH5	2441.0	1.034	906.5	1.000	>= 0.689
DH5	2480.0	0.997	907.8	1.000	>= 0.665
DH5	Hopping On	-	78373.2	-	-
3DH5	2402.0	1.311	1201.5	1.000	>= 0.874
3DH5	2441.0	1.312	1208.5	1.000	>= 0.875
3DH5	2480.0	1.306	1186.6	1.000	>= 0.871
3DH5	Hopping On	-	78508.6	-	-

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

20 dB Bandwidth and 99 % Occupied Bandwidth

DH5

2402 MHz

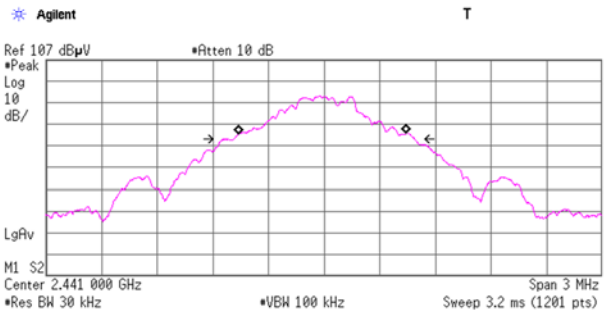


Occupied Bandwidth
904.1804 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -7.890 kHz
x dB Bandwidth 1.027 MHz

2441 MHz

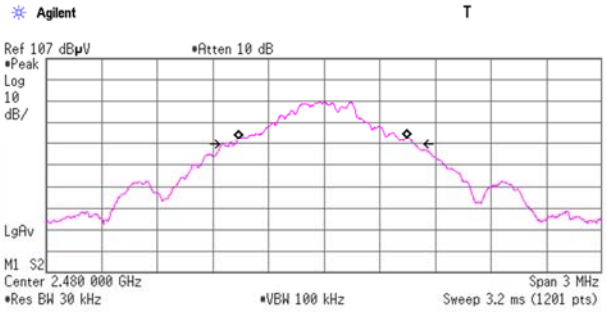


Occupied Bandwidth
906.4593 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -10.301 kHz
x dB Bandwidth 1.034 MHz

2480 MHz



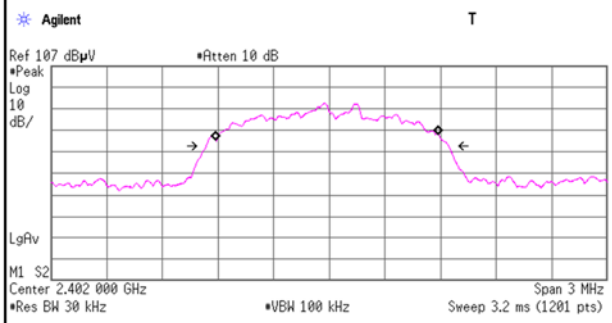
Occupied Bandwidth
907.7840 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -8.564 kHz
x dB Bandwidth 997.271 kHz

3DH5

2402 MHz

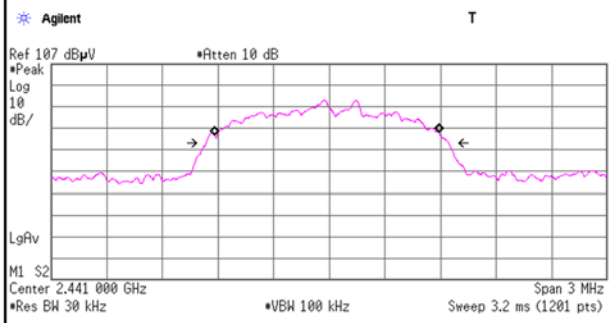


Occupied Bandwidth
1.2015 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -12.856 kHz
x dB Bandwidth 1.311 MHz

2441 MHz

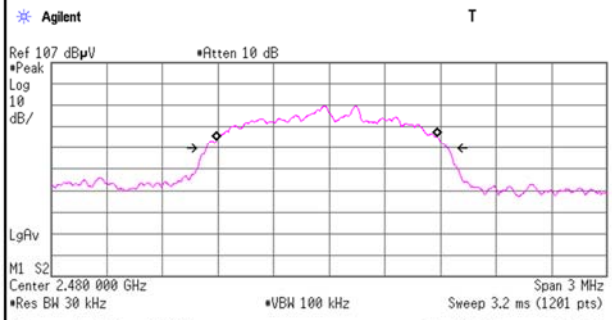


Occupied Bandwidth
1.2085 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -14.852 kHz
x dB Bandwidth 1.312 MHz

2480 MHz

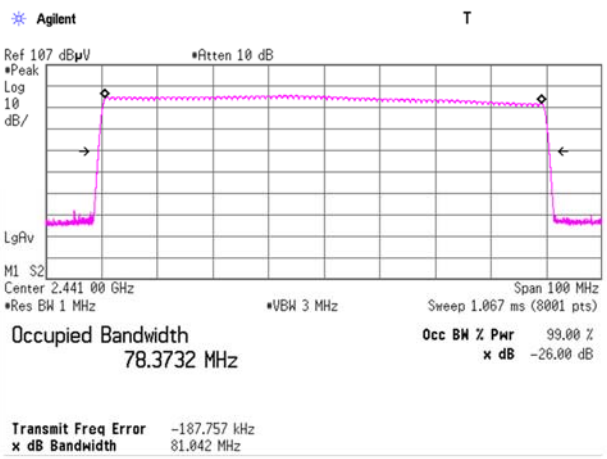
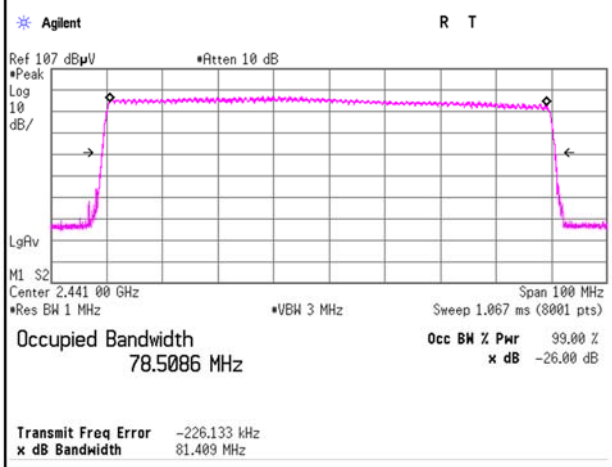


Occupied Bandwidth
1.1866 MHz

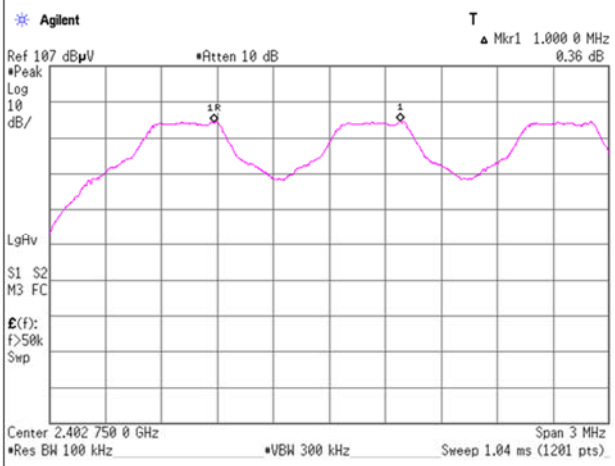
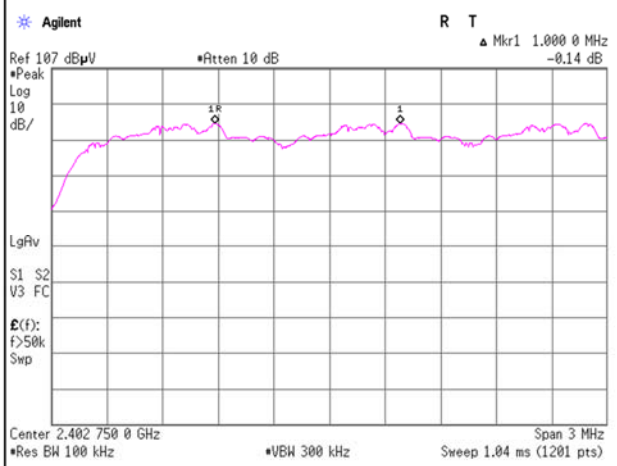
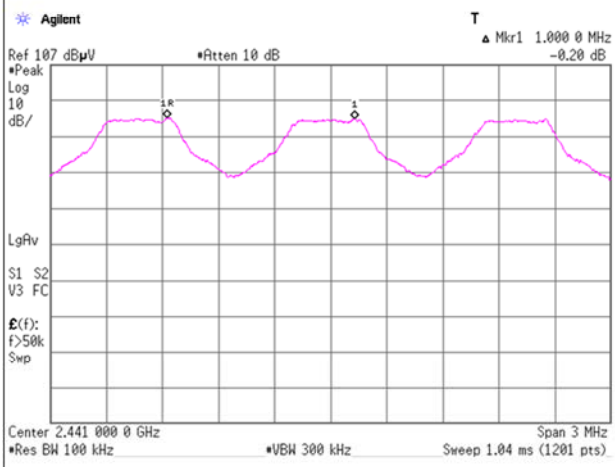
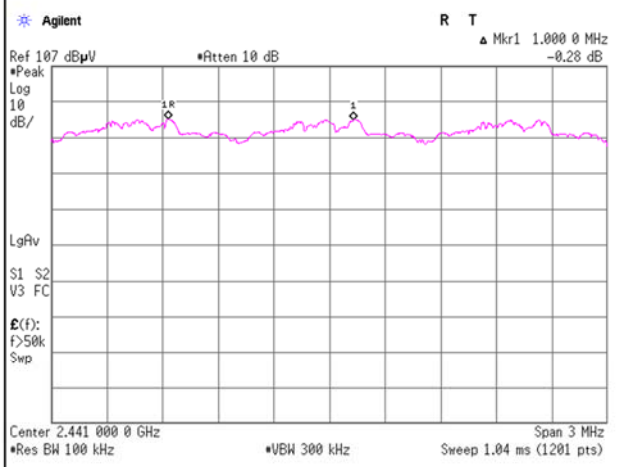
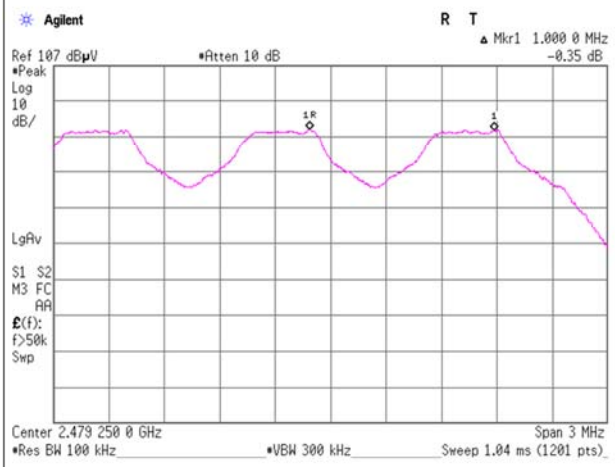
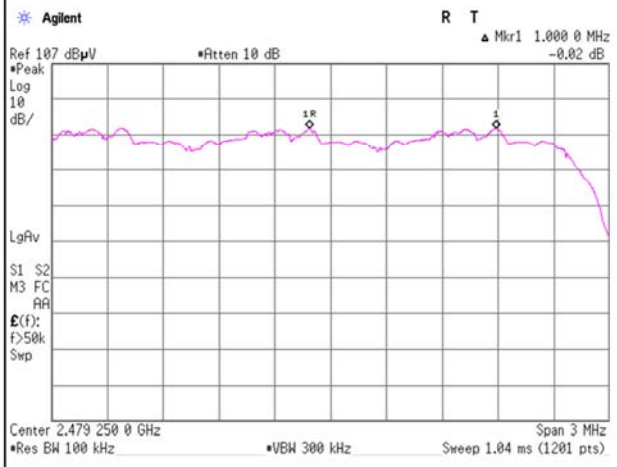
Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -13.068 kHz
x dB Bandwidth 1.306 MHz

20 dB Bandwidth and 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**
	

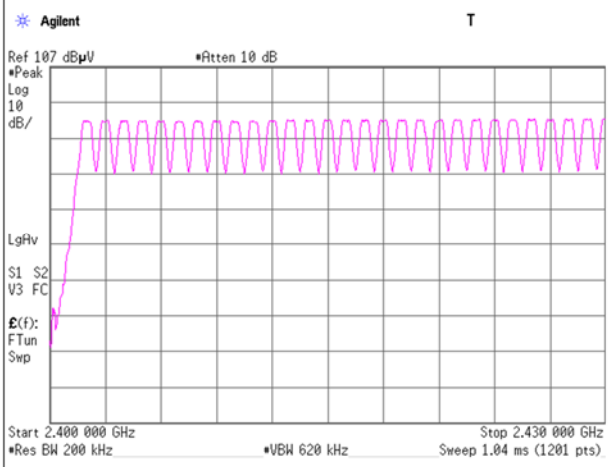
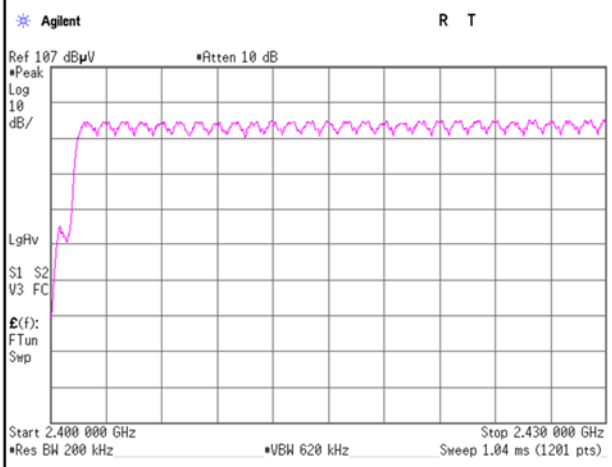
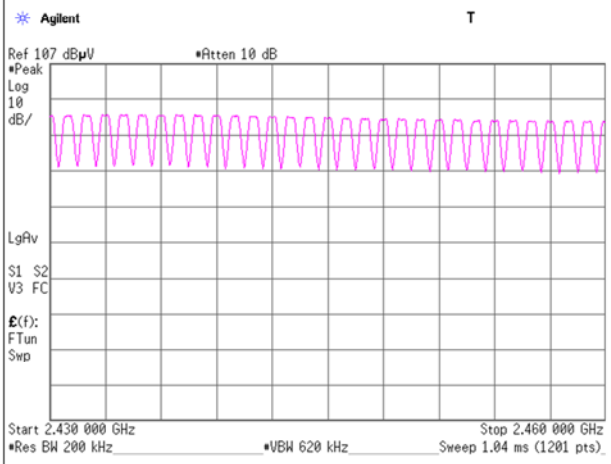
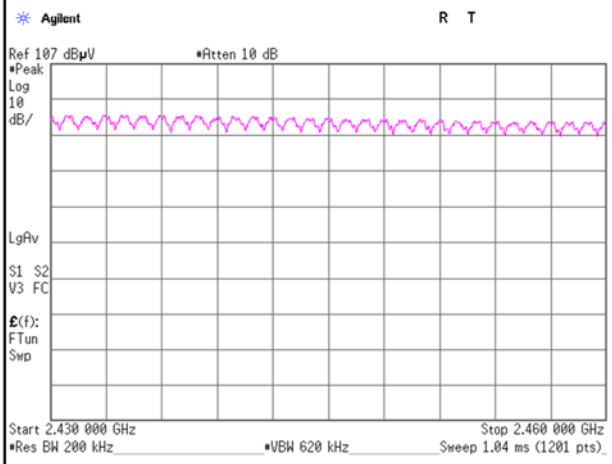
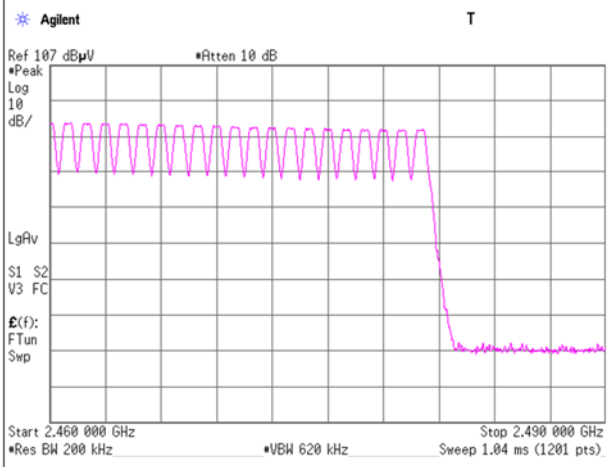
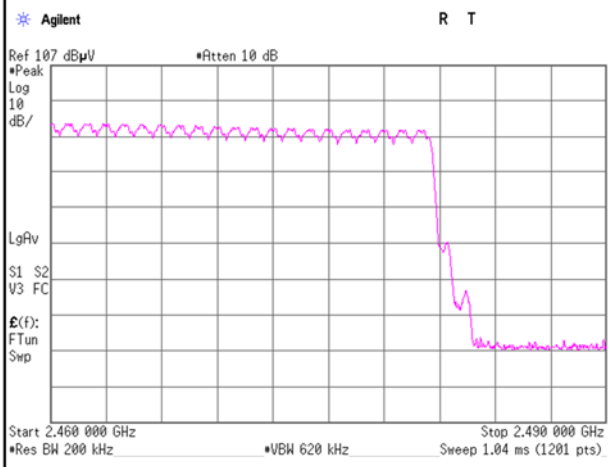
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
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.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
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	50.0 times / 5 s x 31.6 s = 316 times	0.401	127	400
DH3	24.2 times / 5 s x 31.6 s = 153 times	1.659	254	400
DH5	19.4 times / 5 s x 31.6 s = 123 times	2.908	358	400
3DH1	50.2 times / 5 s x 31.6 s = 318 times	0.406	129	400
3DH3	26.2 times / 5 s x 31.6 s = 166 times	1.659	275	400
3DH5	19.2 times / 5 s x 31.6 s = 122 times	2.909	355	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	49	51	50	52	48	50
DH3	24	22	27	25	23	24.2
DH5	20	22	17	19	19	19.4
3DH1	50	49	51	50	51	50.2
3DH3	24	26	28	29	24	26.2
3DH5	16	20	21	19	20	19.2

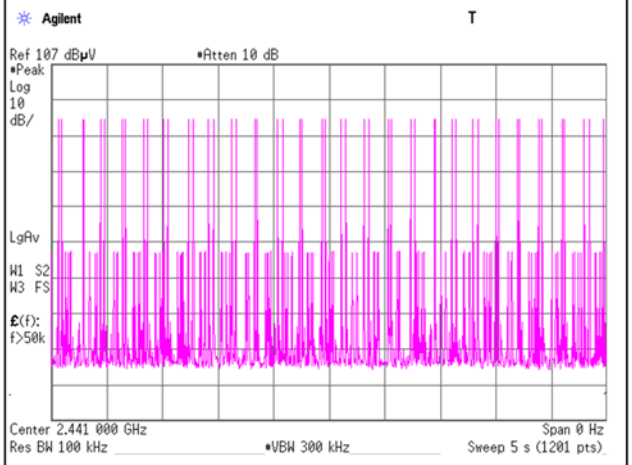
Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

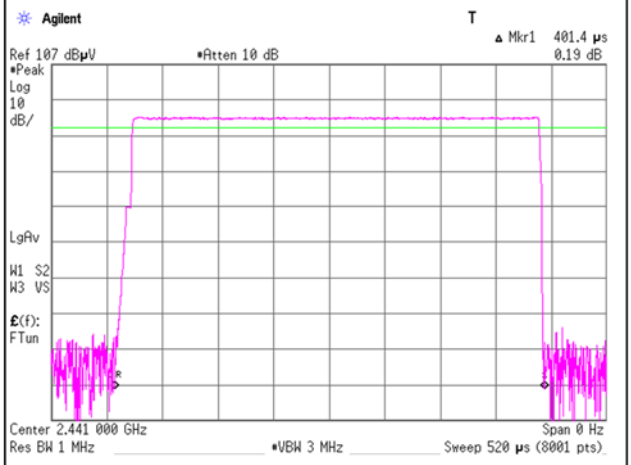
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4 s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4 s regardless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

Dwell time

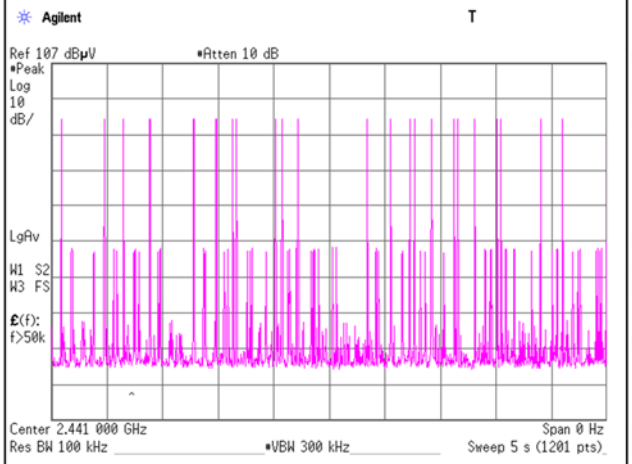
DH1 (1/2)
(Representative chart)



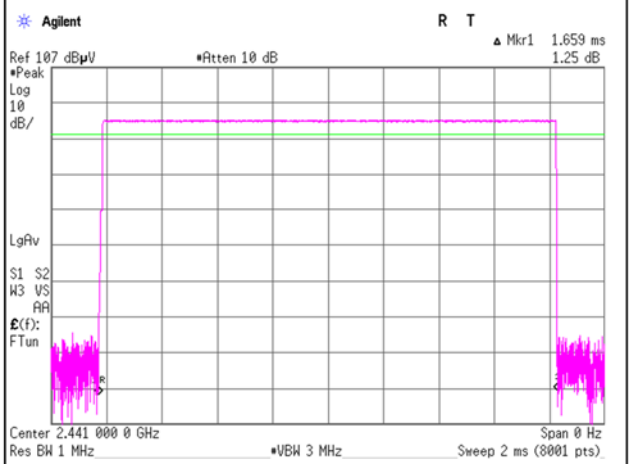
DH1 (2/2)



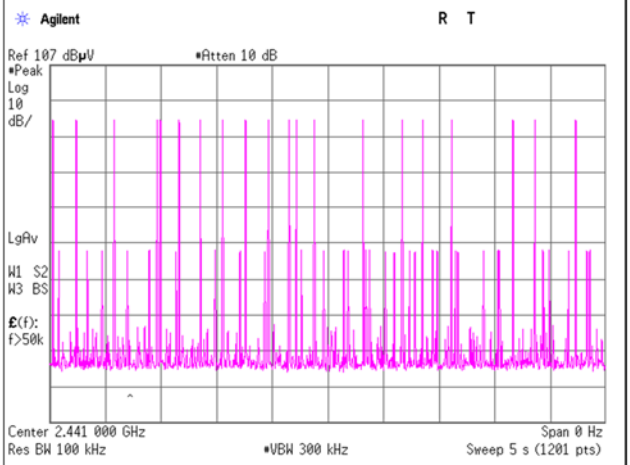
DH3 (1/2)
(Representative chart)



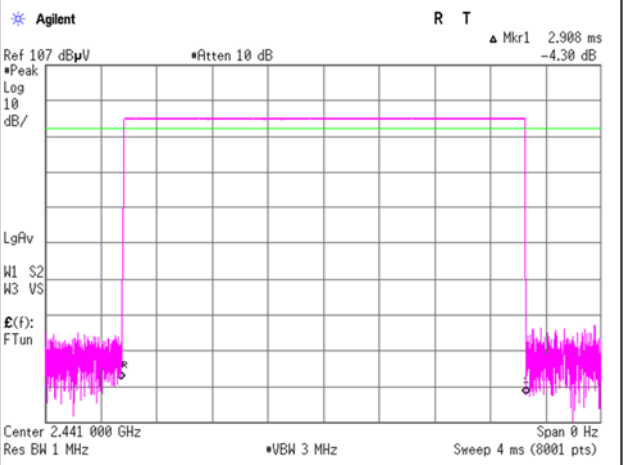
DH3 (2/2)



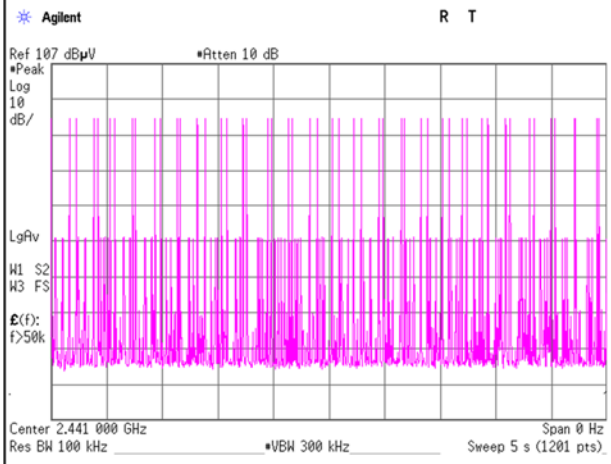
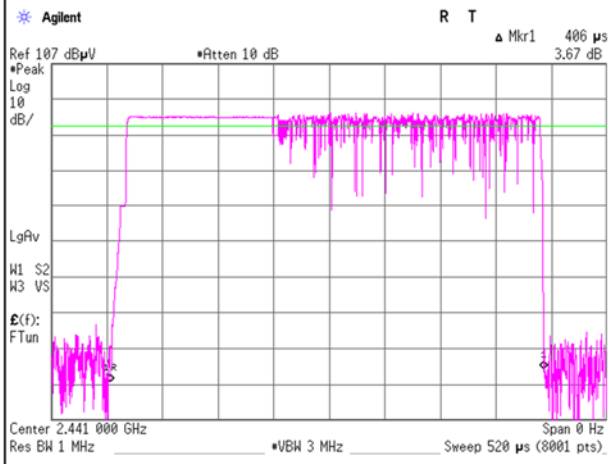
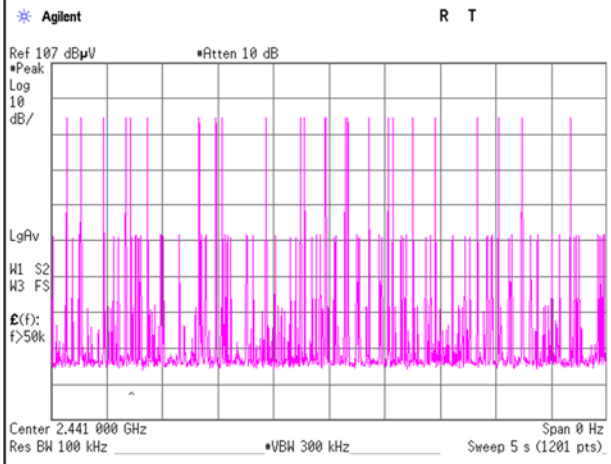
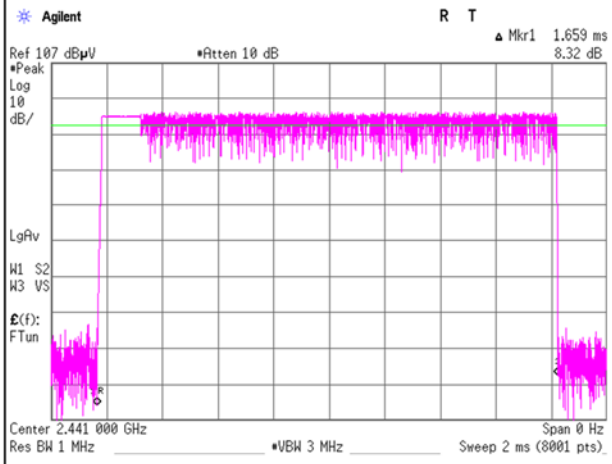
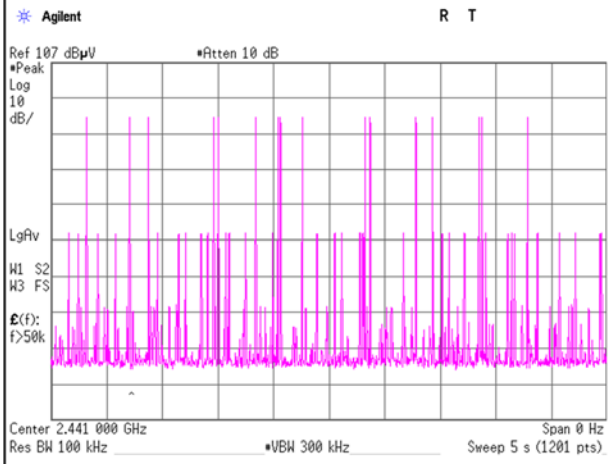
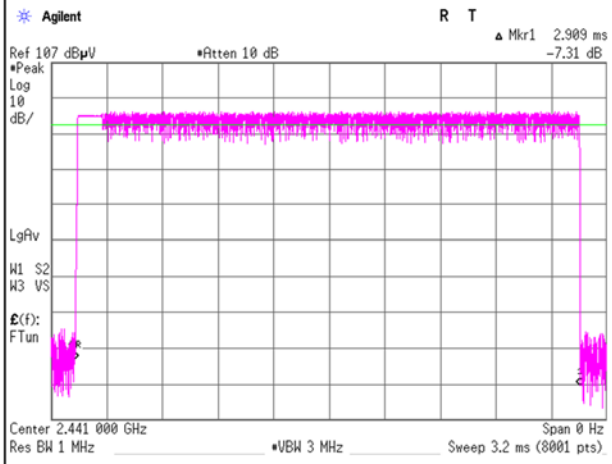
DH5 (1/2)
(Representative chart)



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

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 24, 2022
Temperature / Humidity	27 deg. C / 43 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off

					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	-14.20	2.35	9.64	-2.21	0.60	20.97	125	23.18	-12.30	-14.51	0.04	36.02	4000	50.53
DH5	2441	-13.94	2.37	9.64	-1.93	0.64	20.97	125	22.90	-12.30	-14.23	0.04	36.02	4000	50.25
DH5	2480	-16.32	2.38	9.64	-4.30	0.37	20.97	125	25.27	-12.30	-16.60	0.02	36.02	4000	52.62
2DH5	2402	-13.59	2.35	9.64	-1.60	0.69	20.97	125	22.57	-12.30	-13.90	0.04	36.02	4000	49.92
2DH5	2441	-13.40	2.37	9.64	-1.39	0.73	20.97	125	22.36	-12.30	-13.69	0.04	36.02	4000	49.71
2DH5	2480	-15.60	2.38	9.64	-3.58	0.44	20.97	125	24.55	-12.30	-15.88	0.03	36.02	4000	51.90
3DH5	2402	-13.51	2.35	9.64	-1.52	0.70	20.97	125	22.49	-12.30	-13.82	0.04	36.02	4000	49.84
3DH5	2441	-13.10	2.37	9.64	-1.09	0.78	20.97	125	22.06	-12.30	-13.39	0.05	36.02	4000	49.41
3DH5	2480	-15.22	2.38	9.64	-3.20	0.48	20.97	125	24.17	-12.30	-15.50	0.03	36.02	4000	51.52

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

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 24, 2022
Temperature / Humidity	27 deg. C / 43 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off

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	-16.28	2.35	9.64	-4.29	0.37	1.12	-3.17	0.48
DH5	2441	-16.24	2.37	9.64	-4.23	0.38	1.12	-3.11	0.49
DH5	2480	-19.76	2.38	9.64	-7.74	0.17	1.12	-6.62	0.22
2DH5	2402	-17.22	2.35	9.64	-5.23	0.30	1.12	-4.11	0.39
2DH5	2441	-16.87	2.37	9.64	-4.86	0.33	1.12	-3.74	0.42
2DH5	2480	-20.32	2.38	9.64	-8.30	0.15	1.12	-7.18	0.19
3DH5	2402	-17.20	2.35	9.64	-5.21	0.30	1.11	-4.10	0.39
3DH5	2441	-16.85	2.37	9.64	-4.84	0.33	1.11	-3.73	0.42
3DH5	2480	-20.29	2.38	9.64	-8.27	0.15	1.11	-7.16	0.19

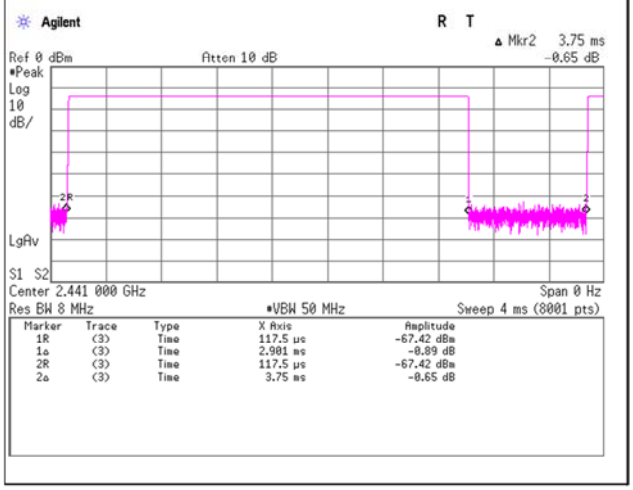
Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Result (Time average) + Duty factor

Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off

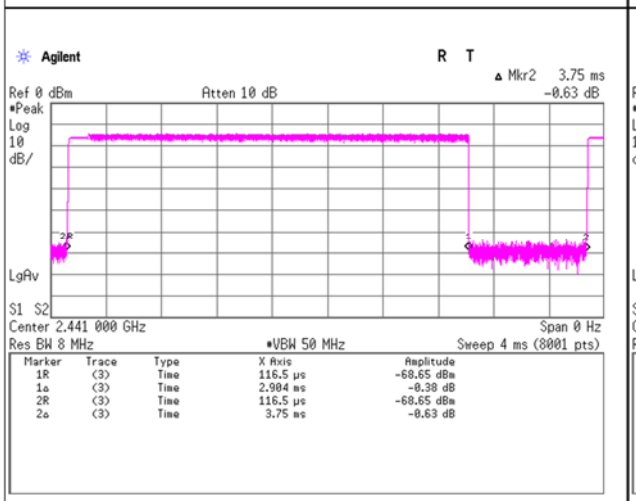
DH5

Tx on / (Tx on + Tx off) =	0.774
Tx on / (Tx on + Tx off) * 100 =	77.4 %
Duty factor = 10 * log (3.75 / 2.901) =	1.12 dB
VBW: 1 / on time = 341.76 Hz <	360.00 Hz



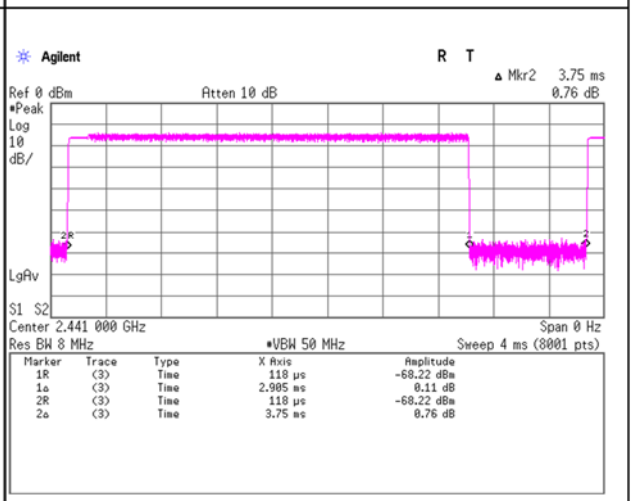
2DH5

Tx on / (Tx on + Tx off) =	0.774
Tx on / (Tx on + Tx off) * 100 =	77.4 %
Duty factor = 10 * log (3.75 / 2.904) =	1.12 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 (3.75 / 2.905) =	1.11 dB
VBW: 1 / on time = 341.3 Hz <	360.00 Hz



Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	1	2
Date	July 23, 2022	July 25, 2022
Temperature / Humidity	24 deg.C, 57 %RH	22 deg.C, 66 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)	Shiro Kobayashi (10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	45.56	27.85	14.18	39.62	2.26	50.23	73.9	23.6	116	235	-
Hori.	4804.000	PK	45.49	31.17	6.70	39.73	2.26	45.89	73.9	28.0	150	0	-
Hori.	7206.000	PK	44.67	36.88	8.30	39.52	2.26	52.59	73.9	21.3	150	0	-
Hori.	9608.000	PK	46.27	38.11	9.81	39.73	2.26	56.72	73.9	17.1	150	0	-
Hori.	2390.000	AV	33.64	27.85	14.18	39.62	2.26	38.31	53.9	15.5	116	235	VBW: 360 Hz
Hori.	4804.000	AV	33.57	31.17	6.70	39.73	2.26	33.97	53.9	19.9	150	0	VBW: 360 Hz, Floor noise
Hori.	7206.000	AV	33.36	36.88	8.30	39.52	2.26	41.28	53.9	12.6	150	0	VBW: 360 Hz, Floor noise
Hori.	9608.000	AV	34.11	38.11	9.81	39.73	2.26	44.56	53.9	**9.3**	150	0	VBW: 360 Hz, Floor noise
Vert.	2390.000	PK	46.17	27.85	14.18	39.62	2.26	50.84	73.9	23.0	100	341	-
Vert.	4804.000	PK	45.45	31.17	6.70	39.73	2.26	45.85	73.9	28.0	150	0	-
Vert.	7206.000	PK	44.74	36.88	8.30	39.52	2.26	52.66	73.9	21.2	150	0	-
Vert.	9608.000	PK	45.70	38.11	9.81	39.73	2.26	56.15	73.9	17.7	150	0	-
Vert.	2390.000	AV	33.67	27.85	14.18	39.62	2.26	38.34	53.9	15.5	100	341	VBW: 360 Hz
Vert.	4804.000	AV	33.72	31.17	6.70	39.73	2.26	34.12	53.9	19.7	150	0	VBW: 360 Hz, Floor noise
Vert.	7206.000	AV	33.32	36.88	8.30	39.52	2.26	41.24	53.9	12.6	150	0	VBW: 360 Hz, Floor noise
Vert.	9608.000	AV	34.12	38.11	9.81	39.73	2.26	44.57	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 (3.89 m / 3.0 m) = 2.26 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.

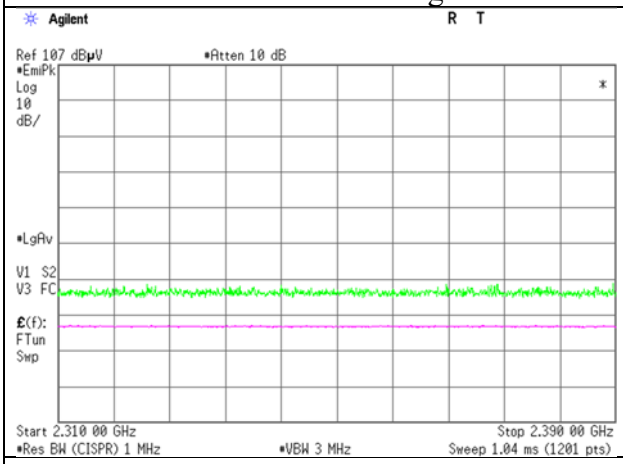
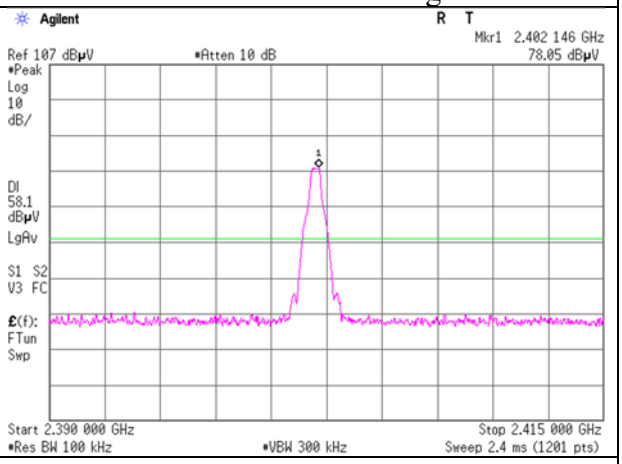
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

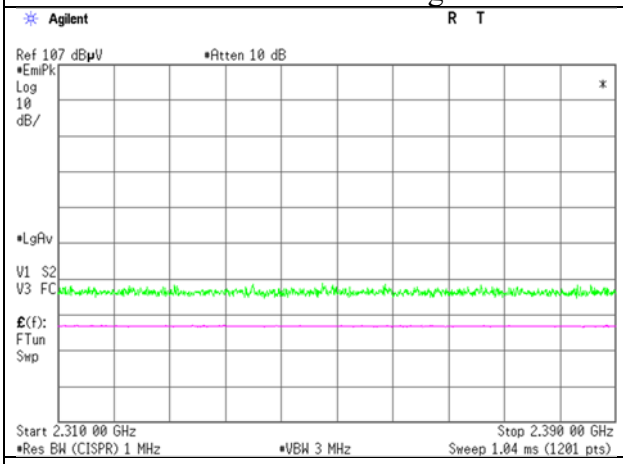
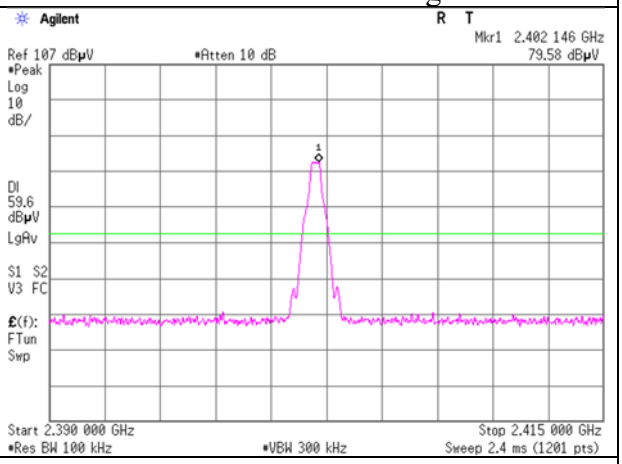
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	78.02	27.83	14.19	39.62	2.26	82.68	-	-	Carrier
Hori.	2400.000	PK	36.61	27.83	14.19	39.62	2.26	41.27	62.6	21.3	-
Vert.	2402.000	PK	79.61	27.83	14.19	39.62	2.26	84.27	-	-	Carrier
Vert.	2400.000	PK	37.29	27.83	14.19	39.62	2.26	41.95	64.2	22.2	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 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	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

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

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20 dBc 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	1	2
Date	July 23, 2022	July 25, 2022
Temperature / Humidity	24 deg.C, 57 %RH	22 deg.C, 66 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)	Shiro Kobayashi (10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4882.000	PK	45.27	31.23	6.75	39.76	2.26	45.75	73.9	28.1	150	0	-
Hori.	7323.000	PK	40.44	36.93	8.38	39.48	2.26	48.53	73.9	25.3	150	0	-
Hori.	9764.000	PK	45.61	38.56	9.82	39.66	2.26	56.59	73.9	17.3	150	0	-
Hori.	4882.000	AV	33.50	31.23	6.75	39.76	2.26	33.98	53.9	19.9	150	0	VBW: 360 Hz, Floor noise
Hori.	7323.000	AV	32.79	36.93	8.38	39.48	2.26	40.88	53.9	13.0	150	0	VBW: 360 Hz, Floor noise
Hori.	9764.000	AV	33.69	38.56	9.82	39.66	2.26	44.67	53.9	**9.2**	150	0	VBW: 360 Hz, Floor noise
Vert.	4882.000	PK	45.20	31.23	6.75	39.76	2.26	45.68	73.9	28.2	150	0	-
Vert.	7323.000	PK	44.76	36.93	8.38	39.48	2.26	52.85	73.9	21.0	150	0	-
Vert.	9764.000	PK	45.31	38.56	9.82	39.66	2.26	56.29	73.9	17.6	150	0	-
Vert.	4882.000	AV	33.52	31.23	6.75	39.76	2.26	34.00	53.9	19.9	150	0	VBW: 360 Hz, Floor noise
Vert.	7323.000	AV	32.78	36.93	8.38	39.48	2.26	40.87	53.9	13.0	150	0	VBW: 360 Hz, Floor noise
Vert.	9764.000	AV	33.66	38.56	9.82	39.66	2.26	44.64	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 (3.89 m / 3.0 m) = 2.26 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	1	2
Date	July 23, 2022	July 25, 2022
Temperature / Humidity	24 deg.C, 57 %RH	22 deg.C, 66 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)	Shiro Kobayashi (10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	45.79	27.72	14.28	39.65	2.26	50.40	73.9	23.5	111	112	-
Hori.	4960.000	PK	45.42	31.40	6.81	39.79	2.26	46.10	73.9	27.8	150	0	-
Hori.	7440.000	PK	44.84	37.02	8.45	39.43	2.26	53.14	73.9	20.7	150	0	-
Hori.	9920.000	PK	44.57	38.57	9.83	39.60	2.26	55.63	73.9	18.2	150	0	-
Hori.	2483.500	AV	33.63	27.72	14.28	39.65	2.26	38.24	53.9	15.6	111	112	VBW: 360 Hz
Hori.	4960.000	AV	33.59	31.40	6.81	39.79	2.26	34.27	53.9	19.6	150	0	VBW: 360 Hz, Floor noise
Hori.	7440.000	AV	33.19	37.02	8.45	39.43	2.26	41.49	53.9	12.4	150	0	VBW: 360 Hz, Floor noise
Hori.	9920.000	AV	32.77	38.57	9.83	39.60	2.26	43.83	53.9	**10.0**	150	0	VBW: 360 Hz, Floor noise
Vert.	2483.500	PK	45.42	27.72	14.28	39.65	2.26	50.03	73.9	23.8	161	190	-
Vert.	4960.000	PK	45.13	31.40	6.81	39.79	2.26	45.81	73.9	28.0	150	0	-
Vert.	7440.000	PK	45.25	37.02	8.45	39.43	2.26	53.55	73.9	20.3	150	0	-
Vert.	9920.000	PK	44.97	38.57	9.83	39.60	2.26	56.03	73.9	17.8	150	0	-
Vert.	2483.500	AV	33.53	27.72	14.28	39.65	2.26	38.14	53.9	15.7	161	190	VBW: 360 Hz
Vert.	4960.000	AV	33.49	31.40	6.81	39.79	2.26	34.17	53.9	19.7	150	0	VBW: 360 Hz, Floor noise
Vert.	7440.000	AV	33.09	37.02	8.45	39.43	2.26	41.39	53.9	12.5	150	0	VBW: 360 Hz, Floor noise
Vert.	9920.000	AV	32.78	38.57	9.83	39.60	2.26	43.84	53.9	**10.0**	150	0	VBW: 360 Hz, Floor noise

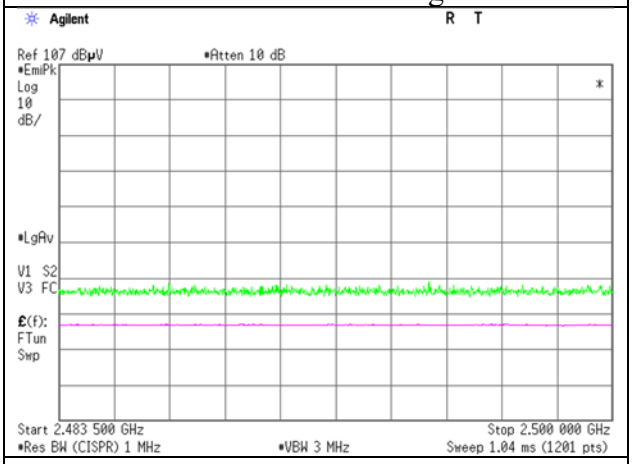
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

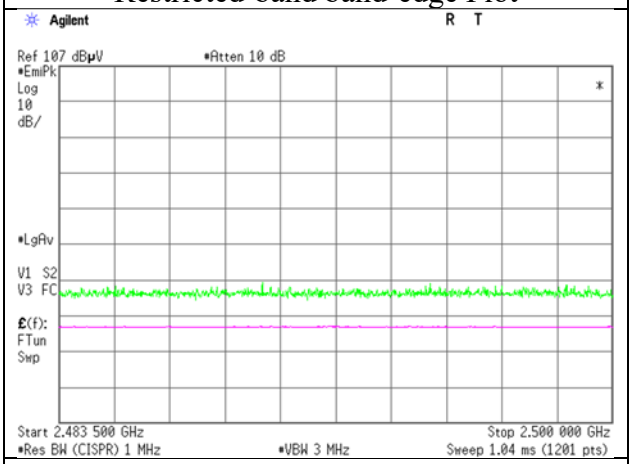
Restricted-band band-edge Plot



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	1	2
Date	July 23, 2022	July 25, 2022
Temperature / Humidity	24 deg.C, 57 %RH	22 deg.C, 66 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)	Shiro Kobayashi (10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	45.39	27.85	14.18	39.62	2.26	50.06	73.9	23.8	116	237	-
Hori.	4804.000	PK	45.13	31.17	6.70	39.73	2.26	45.53	73.9	28.3	150	0	-
Hori.	7206.000	PK	45.34	36.88	8.30	39.52	2.26	53.26	73.9	20.6	150	0	-
Hori.	9608.000	PK	45.91	38.11	9.81	39.73	2.26	56.36	73.9	17.5	150	0	-
Hori.	2390.000	AV	33.58	27.85	14.18	39.62	2.26	38.25	53.9	15.6	116	237	VBW: 360 Hz
Hori.	4804.000	AV	33.53	31.17	6.70	39.73	2.26	33.93	53.9	19.9	150	0	VBW: 360 Hz, Floor noise
Hori.	7206.000	AV	33.30	36.88	8.30	39.52	2.26	41.22	53.9	12.6	150	0	VBW: 360 Hz, Floor noise
Hori.	9608.000	AV	34.08	38.11	9.81	39.73	2.26	44.53	53.9	**9.3**	150	0	VBW: 360 Hz, Floor noise
Vert.	2390.000	PK	45.73	27.85	14.18	39.62	2.26	50.40	73.9	23.5	105	341	-
Vert.	4804.000	PK	44.96	31.17	6.70	39.73	2.26	45.36	73.9	28.5	150	0	-
Vert.	7206.000	PK	45.37	36.88	8.30	39.52	2.26	53.29	73.9	20.6	150	0	-
Vert.	9608.000	PK	45.51	38.11	9.81	39.73	2.26	55.96	73.9	17.9	150	0	-
Vert.	2390.000	AV	33.56	27.85	14.18	39.62	2.26	38.23	53.9	15.6	105	341	VBW: 360 Hz
Vert.	4804.000	AV	33.60	31.17	6.70	39.73	2.26	34.00	53.9	19.9	150	0	VBW: 360 Hz, Floor noise
Vert.	7206.000	AV	33.22	36.88	8.30	39.52	2.26	41.14	53.9	12.7	150	0	VBW: 360 Hz, Floor noise
Vert.	9608.000	AV	34.05	38.11	9.81	39.73	2.26	44.50	53.9	9.4	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 (3.89 m / 3.0 m) = 2.26 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.

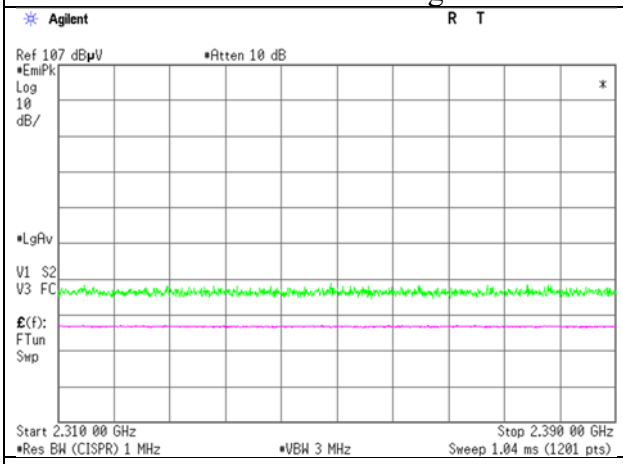
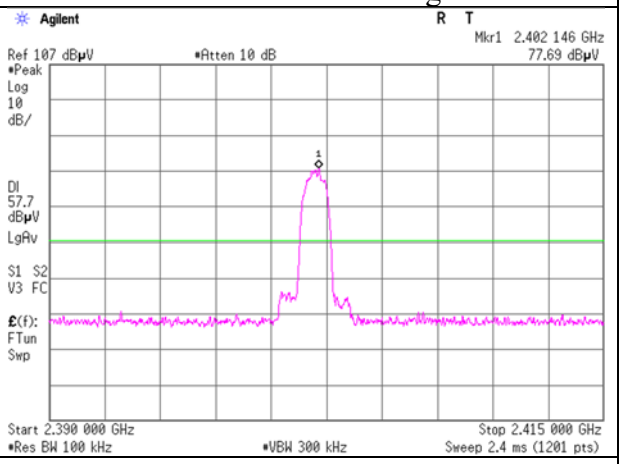
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

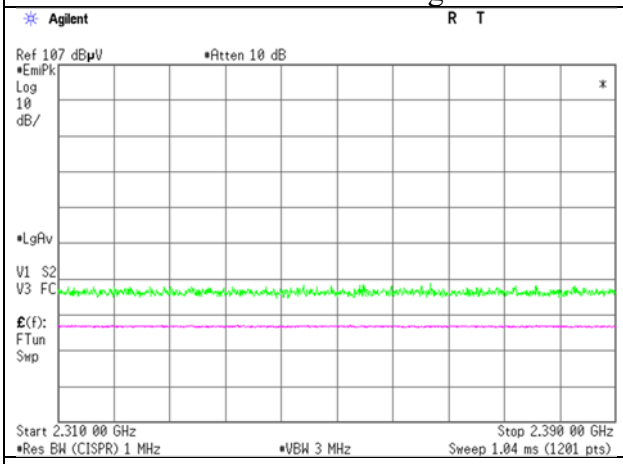
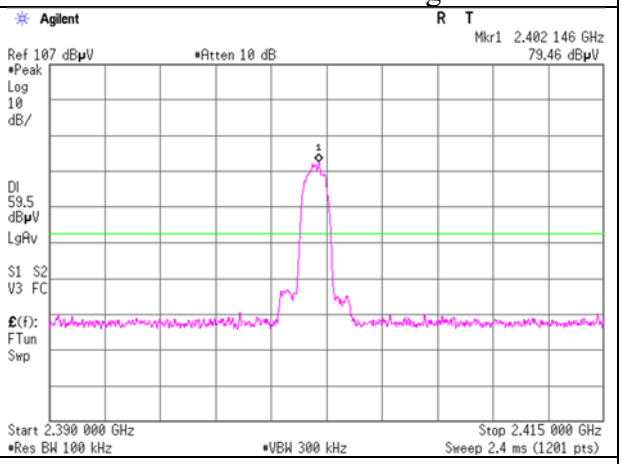
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	77.68	27.83	14.19	39.62	2.26	82.34	-	-	Carrier
Hori.	2400.000	PK	36.92	27.83	14.19	39.62	2.26	41.58	62.3	20.7	-
Vert.	2402.000	PK	79.41	27.83	14.19	39.62	2.26	84.07	-	-	Carrier
Vert.	2400.000	PK	36.78	27.83	14.19	39.62	2.26	41.44	64.0	22.5	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 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	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz

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

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20 dBc 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	2	1	2
Date	July 26, 2022	July 23, 2022	July 25, 2022
Temperature / Humidity	23 deg.C, 69 %RH	24 deg.C, 57 %RH	22 deg.C, 66 %RH
Engineer	Shiro Kobayashi	Yosuke Murakami	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	86.060	QP	45.09	7.49	8.23	31.90	0.00	28.91	40.0	11.0	358	69	-
Hori.	98.291	QP	47.85	9.93	8.09	31.89	0.00	33.98	43.5	9.5	308	50	-
Hori.	103.276	QP	45.46	10.85	8.03	31.89	0.00	32.45	43.5	11.0	306	47	-
Hori.	127.682	QP	40.24	13.78	8.16	31.86	0.00	30.32	43.5	13.1	252	45	-
Hori.	130.992	QP	36.95	13.95	8.23	31.86	0.00	27.27	43.5	16.2	245	48	-
Hori.	137.700	QP	38.96	14.34	8.39	31.85	0.00	29.84	43.5	13.6	231	30	-
Hori.	141.544	QP	36.25	14.49	8.50	31.85	0.00	27.39	43.5	16.1	231	13	-
Hori.	182.156	QP	36.60	16.16	8.81	31.81	0.00	29.76	43.5	13.7	178	216	-
Hori.	200.008	QP	40.46	11.63	5.72	31.79	0.00	26.02	43.5	17.4	162	326	-
Hori.	223.764	QP	50.92	11.33	5.91	31.77	0.00	36.39	46.0	9.6	155	332	-
Hori.	4882.000	PK	45.41	31.23	6.75	39.76	2.26	45.89	73.9	28.0	150	0	-
Hori.	7323.000	PK	44.35	36.93	8.38	39.48	2.26	52.44	73.9	21.4	150	0	-
Hori.	9764.000	PK	45.10	38.56	9.82	39.66	2.26	56.08	73.9	17.8	150	0	-
Hori.	4882.000	AV	33.59	31.23	6.75	39.76	2.26	34.07	53.9	19.8	150	0	VBW: 360 Hz, Floor noise
Hori.	7323.000	AV	32.79	36.93	8.38	39.48	2.26	40.88	53.9	13.0	150	0	VBW: 360 Hz, Floor noise
Hori.	9764.000	AV	33.68	38.56	9.82	39.66	2.26	44.66	53.9	**9.2**	150	0	VBW: 360 Hz, Floor noise
Vert.	127.661	QP	36.90	13.77	8.16	31.86	0.00	26.97	43.5	16.5	100	292	-
Vert.	131.130	QP	37.70	13.96	8.23	31.86	0.00	28.03	43.5	15.4	100	2	-
Vert.	137.708	QP	37.49	14.34	8.39	31.85	0.00	28.37	43.5	15.1	100	218	-
Vert.	4882.000	PK	45.19	31.23	6.75	39.76	2.26	45.67	73.9	28.2	150	0	-
Vert.	7323.000	PK	44.95	36.93	8.38	39.48	2.26	53.04	73.9	20.8	150	0	-
Vert.	9764.000	PK	45.29	38.56	9.82	39.66	2.26	56.27	73.9	17.6	150	0	-
Vert.	4882.000	AV	33.53	31.23	6.75	39.76	2.26	34.01	53.9	19.8	150	0	VBW: 360 Hz, Floor noise
Vert.	7323.000	AV	32.82	36.93	8.38	39.48	2.26	40.91	53.9	12.9	150	0	VBW: 360 Hz, Floor noise
Vert.	9764.000	AV	33.59	38.56	9.82	39.66	2.26	44.57	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 (3.89 m / 3.0 m) = 2.26 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	1	2
Date	July 23, 2022	July 25, 2022
Temperature / Humidity	24 deg.C, 57 %RH	22 deg.C, 66 %RH
Engineer	Yosuke Murakami	Shiro Kobayashi
	(1 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	45.06	27.72	14.28	39.65	2.26	49.67	73.9	24.2	111	112	-
Hori.	4960.000	PK	45.44	31.40	6.81	39.79	2.26	46.12	73.9	27.7	150	0	-
Hori.	7440.000	PK	45.85	37.02	8.45	39.43	2.26	54.15	73.9	19.7	150	0	-
Hori.	9920.000	PK	43.78	38.57	9.83	39.60	2.26	54.84	73.9	19.0	150	0	-
Hori.	2483.500	AV	33.70	27.72	14.28	39.65	2.26	38.31	53.9	15.5	111	112	VBW: 360 Hz
Hori.	4960.000	AV	33.44	31.40	6.81	39.79	2.26	34.12	53.9	19.7	150	0	VBW: 360 Hz, Floor noise
Hori.	7440.000	AV	33.19	37.02	8.45	39.43	2.26	41.49	53.9	12.4	150	0	VBW: 360 Hz, Floor noise
Hori.	9920.000	AV	32.87	38.57	9.83	39.60	2.26	43.93	53.9	9.9	150	0	VBW: 360 Hz, Floor noise
Vert.	2483.500	PK	45.11	27.72	14.28	39.65	2.26	49.72	73.9	24.1	166	189	-
Vert.	4960.000	PK	45.49	31.40	6.81	39.79	2.26	46.17	73.9	27.7	150	0	-
Vert.	7440.000	PK	45.82	37.02	8.45	39.43	2.26	54.12	73.9	19.7	150	0	-
Vert.	9920.000	PK	43.82	38.57	9.83	39.60	2.26	54.88	73.9	19.0	150	0	-
Vert.	2483.500	AV	33.65	27.72	14.28	39.65	2.26	38.26	53.9	15.6	166	189	VBW: 360 Hz
Vert.	4960.000	AV	33.41	31.40	6.81	39.79	2.26	34.09	53.9	19.8	150	0	VBW: 360 Hz, Floor noise
Vert.	7440.000	AV	33.24	37.02	8.45	39.43	2.26	41.54	53.9	12.3	150	0	VBW: 360 Hz, Floor noise
Vert.	9920.000	AV	32.99	38.57	9.83	39.60	2.26	44.05	53.9	**9.8**	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 (3.89 m / 3.0 m) = 2.26 dB

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

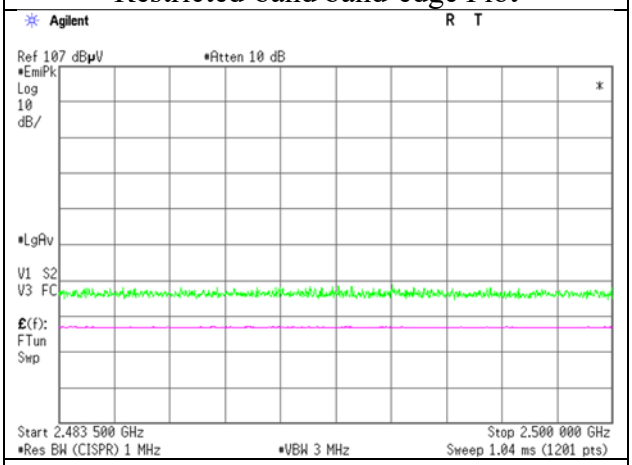
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

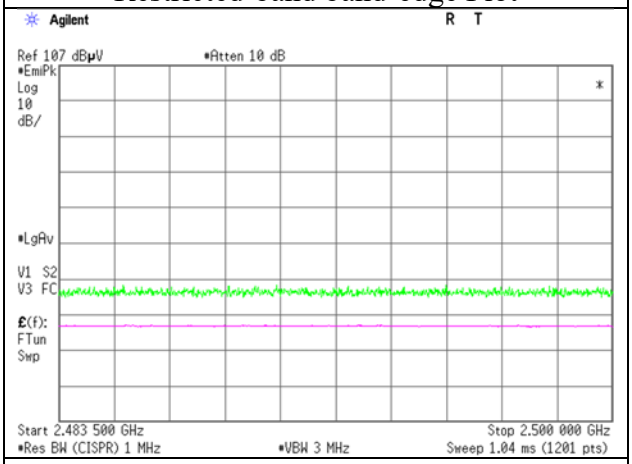
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

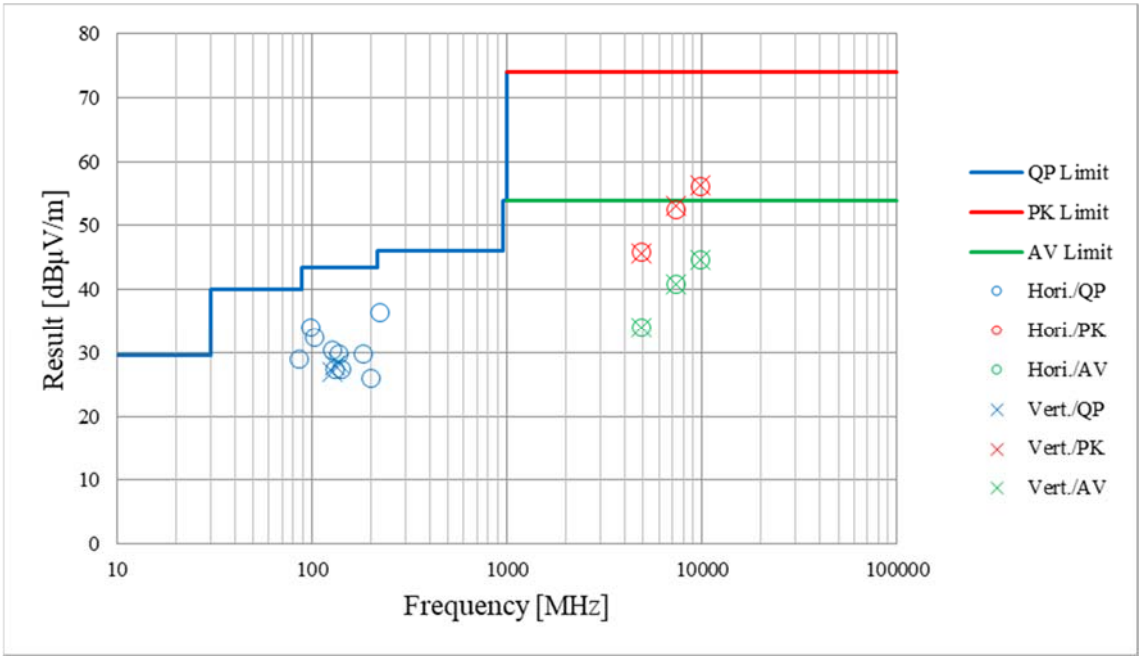


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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	2	1	2
Date	July 26, 2022	July 23, 2022	July 25, 2022
Temperature / Humidity	23 deg.C, 69 %RH	24 deg.C, 57 %RH	22 deg.C, 66 %RH
Engineer	Shiro Kobayashi (30 MHz -1 GHz)	Yosuke Murakami (1 GHz -10 GHz)	Shiro Kobayashi (10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz		



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

Radiated Spurious Emission

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz with 11n-20 MIMO 5745 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	45.63	27.85	14.18	39.62	2.26	50.30	73.9	23.6	118	236	-
Hori.	2390.000	AV	33.52	27.85	14.18	39.62	2.26	38.19	53.9	15.7	118	236	VBW: 360 Hz
Vert.	2390.000	PK	45.24	27.85	14.18	39.62	2.26	49.91	73.9	23.9	100	342	-
Vert.	2390.000	AV	33.58	27.85	14.18	39.62	2.26	38.25	53.9	**15.6**	100	342	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 (3.89 m / 3.0 m) = 2.26 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.

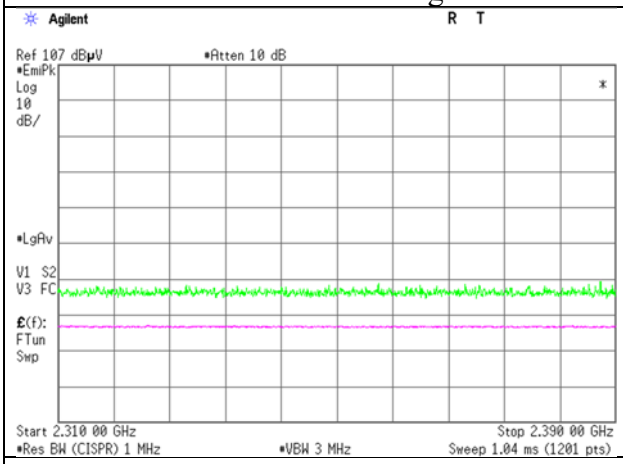
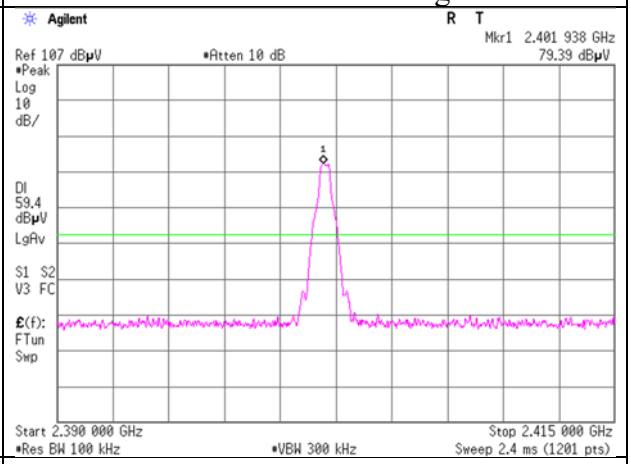
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

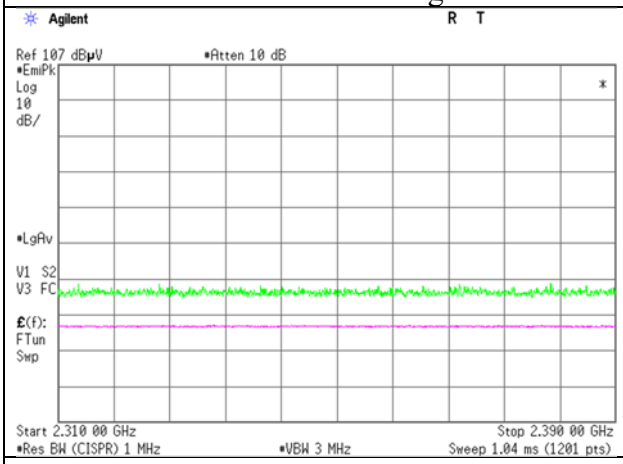
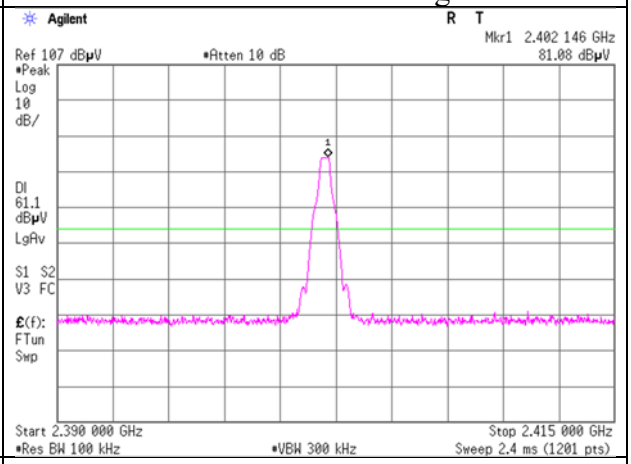
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	79.44	27.83	14.19	39.62	2.26	84.10	-	-	Carrier
Hori.	2400.000	PK	36.39	27.83	14.19	39.62	2.26	41.05	64.1	23.0	-
Vert.	2402.000	PK	81.16	27.83	14.19	39.62	2.26	85.82	-	-	Carrier
Vert.	2400.000	PK	36.41	27.83	14.19	39.62	2.26	41.07	65.8	24.7	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 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	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz with 11n-20 MIMO 5745 MHz

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

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20 dBc 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	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz with 11n-20 MIMO 5745 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	45.52	27.72	14.28	39.65	2.26	50.13	73.9	23.7	111	112	-
Hori.	2483.500	AV	33.52	27.72	14.28	39.65	2.26	38.13	53.9	15.7	111	112	VBW: 360 Hz
Vert.	2483.500	PK	45.39	27.72	14.28	39.65	2.26	50.00	73.9	23.9	165	188	-
Vert.	2483.500	AV	33.65	27.72	14.28	39.65	2.26	38.26	53.9	**15.6**	165	188	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 (3.89 m / 3.0 m) = 2.26 dB

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

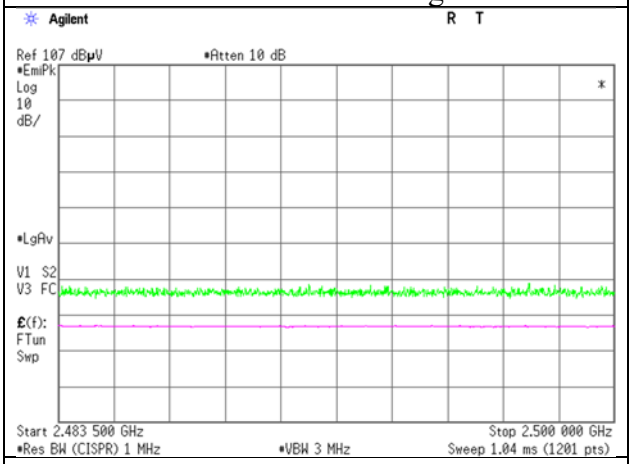
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz with 11n-20 MIMO 5745 MHz

Horizontal

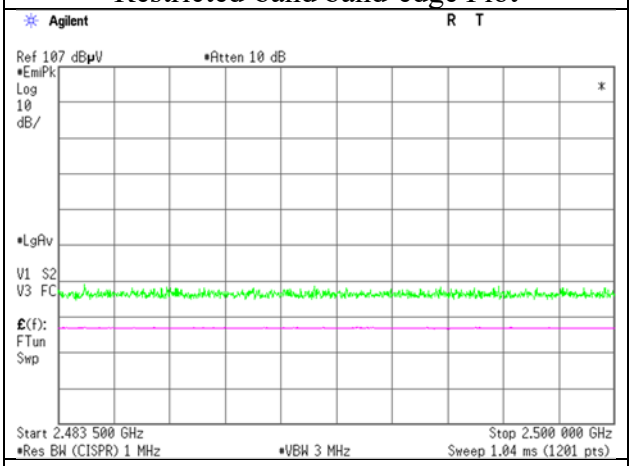
Restricted-band band-edge Plot



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	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz with 11n-20 MIMO 5745 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	45.47	27.85	14.18	39.62	2.26	50.14	73.9	23.7	117	235	-
Hori.	2390.000	AV	33.53	27.85	14.18	39.62	2.26	38.20	53.9	**15.7**	117	235	VBW: 360 Hz
Vert.	2390.000	PK	45.86	27.85	14.18	39.62	2.26	50.53	73.9	23.3	105	340	-
Vert.	2390.000	AV	33.53	27.85	14.18	39.62	2.26	38.20	53.9	**15.7**	105	340	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 (3.89 m / 3.0 m) = 2.26 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.

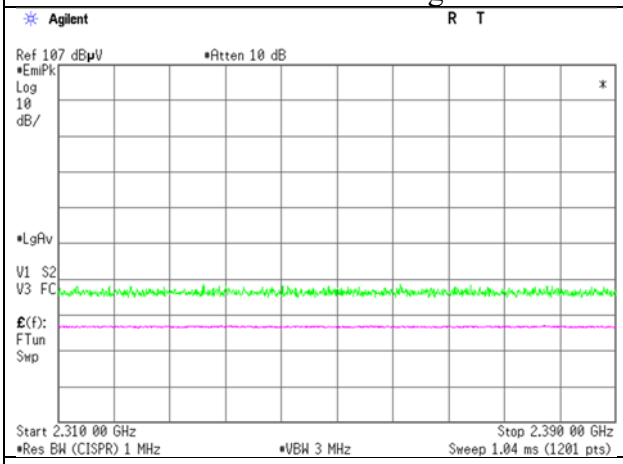
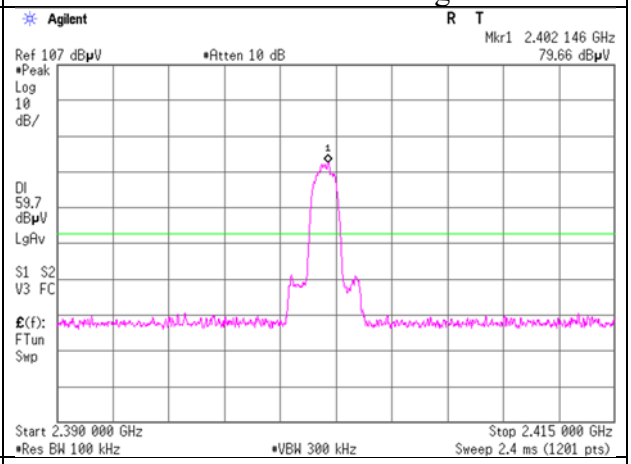
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

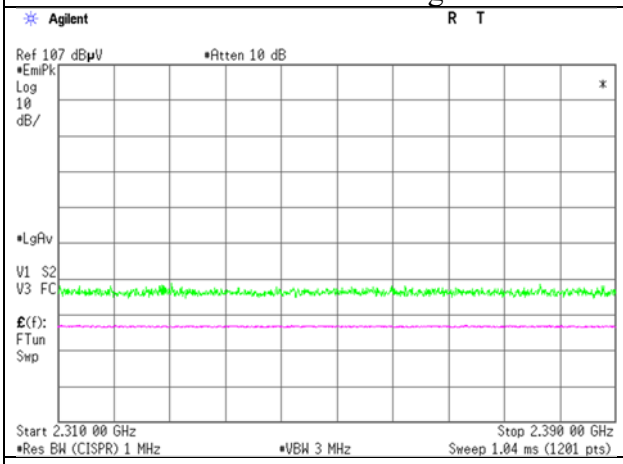
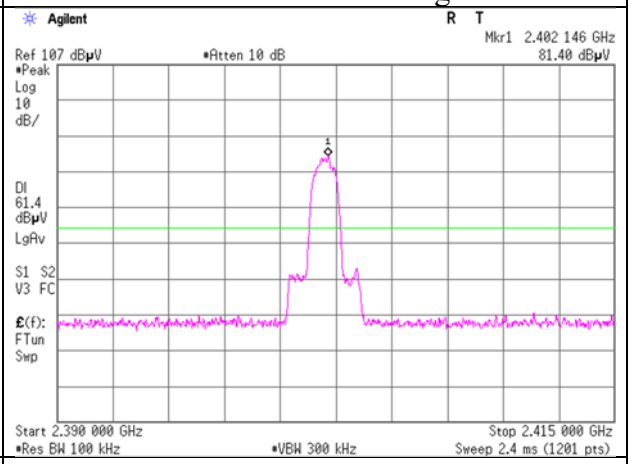
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	79.86	27.83	14.19	39.62	2.26	84.52	-	-	Carrier
Hori.	2400.000	PK	36.97	27.83	14.19	39.62	2.26	41.63	64.5	22.8	-
Vert.	2402.000	PK	81.54	27.83	14.19	39.62	2.26	86.20	-	-	Carrier
Vert.	2400.000	PK	36.31	27.83	14.19	39.62	2.26	40.97	66.2	25.2	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.89 m / 3.0 m) = 2.26 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	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz with 11n-20 MIMO 5745 MHz

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

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20 dBc 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	2	1	1	2
Date	July 26, 2022	July 23, 2022	July 24, 2022	July 25, 2022
Temperature / Humidity	23 deg.C, 69 %RH	24 deg.C, 57 %RH	23 deg.C, 44 %RH	22 deg.C, 66 %RH
Engineer	Shiro Kobayashi	Yosuke Murakami	Akihiro Oda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz with 11n-20 MIMO 5745 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	86.063	QP	43.58	7.49	8.23	31.90	0.00	27.40	40.0	12.6	343	72	-
Hori.	98.302	QP	47.48	9.93	8.09	31.89	0.00	33.61	43.5	9.8	319	223	-
Hori.	126.342	QP	36.61	13.63	8.14	31.86	0.00	26.52	43.5	16.9	246	61	-
Hori.	130.684	QP	35.89	13.94	8.22	31.86	0.00	26.19	43.5	17.3	243	44	-
Hori.	131.781	QP	36.48	14.01	8.25	31.86	0.00	26.88	43.5	16.6	248	44	-
Hori.	143.588	QP	37.14	14.61	8.54	31.85	0.00	28.44	43.5	15.0	227	3	-
Hori.	147.455	QP	42.81	14.77	8.61	31.84	0.00	34.35	43.5	9.1	217	50	-
Hori.	200.285	QP	41.61	11.63	5.72	31.79	0.00	27.17	43.5	16.3	175	99	-
Hori.	223.761	QP	52.64	11.33	5.91	31.77	0.00	38.11	46.0	7.8	137	339	-
Hori.	292.610	QP	46.31	13.66	6.44	31.71	0.00	34.70	46.0	11.3	123	345	-
Hori.	4882.000	PK	47.34	31.23	7.69	39.76	2.26	48.76	73.9	25.1	124	118	-
Hori.	7323.000	PK	44.41	36.93	9.54	39.48	2.26	53.66	73.9	20.2	150	0	-
Hori.	9764.000	PK	46.12	38.56	11.07	39.66	2.26	58.35	73.9	15.5	150	0	-
Hori.	4882.000	AV	38.98	31.23	7.69	39.76	2.26	40.40	53.9	13.5	124	118	VBW:360 Hz
Hori.	7323.000	AV	32.70	36.93	9.54	39.48	2.26	41.95	53.9	11.9	150	0	VBW:360 Hz, Floor noise
Hori.	9764.000	AV	33.86	38.56	11.07	39.66	2.26	46.09	53.9	7.8	150	0	VBW:360 Hz, Floor noise
Vert.	131.424	QP	36.16	13.98	8.24	31.86	0.00	26.52	43.5	16.9	100	264	-
Vert.	4882.000	PK	47.03	31.23	7.69	39.76	2.26	48.45	73.9	25.4	185	176	-
Vert.	7323.000	PK	43.98	36.93	9.54	39.48	2.26	53.23	73.9	20.6	150	0	-
Vert.	9764.000	PK	45.05	38.56	11.07	39.66	2.26	57.28	73.9	16.6	150	0	-
Vert.	4882.000	AV	37.75	31.23	7.69	39.76	2.26	39.17	53.9	14.7	185	176	VBW:360 Hz
Vert.	7323.000	AV	32.69	36.93	9.54	39.48	2.26	41.94	53.9	11.9	150	0	VBW:360 Hz, Floor noise
Vert.	9764.000	AV	33.97	38.56	11.07	39.66	2.26	46.20	53.9	**7.7**	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 (3.89 m / 3.0 m) = 2.26 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	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz with 11n-20 MIMO 5745 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	45.56	27.72	14.28	39.65	2.26	50.17	73.9	23.7	110	114	-
Hori.	2483.500	AV	33.64	27.72	14.28	39.65	2.26	38.25	53.9	**15.6**	110	114	VBW: 360 Hz
Vert.	2483.500	PK	45.73	27.72	14.28	39.65	2.26	50.34	73.9	23.5	165	188	-
Vert.	2483.500	AV	33.57	27.72	14.28	39.65	2.26	38.18	53.9	15.7	165	188	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 (3.89 m / 3.0 m) = 2.26 dB

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

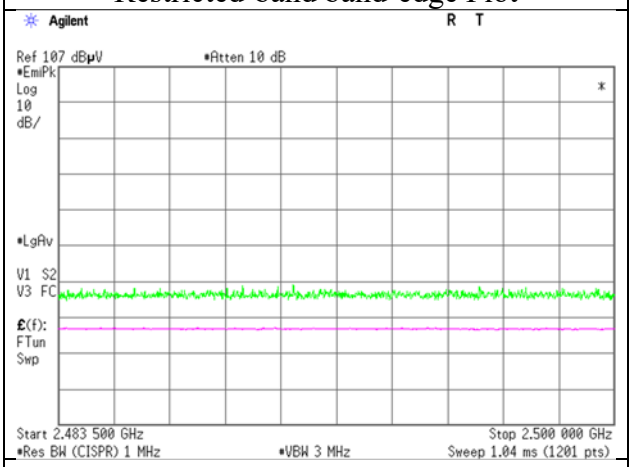
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	July 23, 2022
Temperature / Humidity	24 deg.C, 57 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz with 11n-20 MIMO 5745 MHz

Horizontal

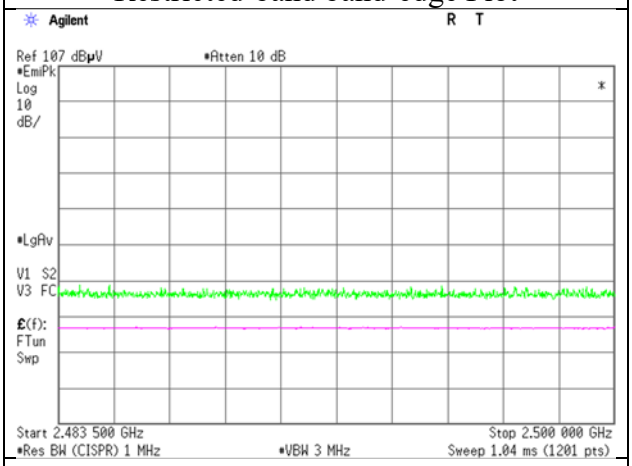
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

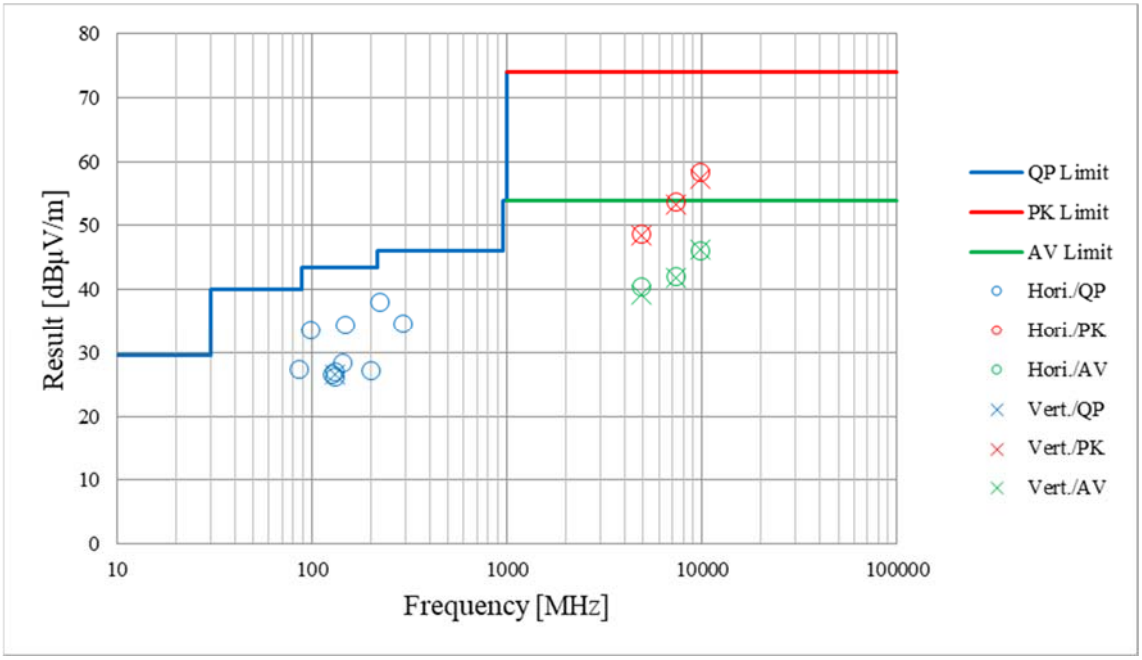


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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	2	1	1	2
Date	July 26, 2022	July 23, 2022	July 24, 2022	July 25, 2022
Temperature / Humidity	23 deg.C, 69 %RH	24 deg.C, 57 %RH	23 deg.C, 44 %RH	22 deg.C, 66 %RH
Engineer	Shiro Kobayashi	Yosuke Murakami	Akihiro Oda	Shiro Kobayashi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz with 11n-20 MIMO 5745 MHz			



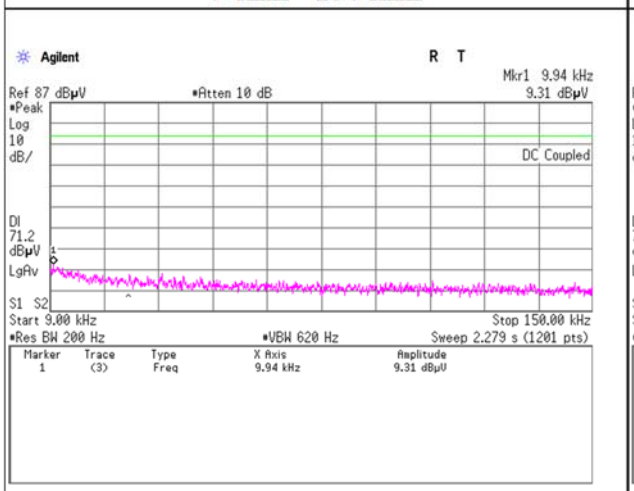
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

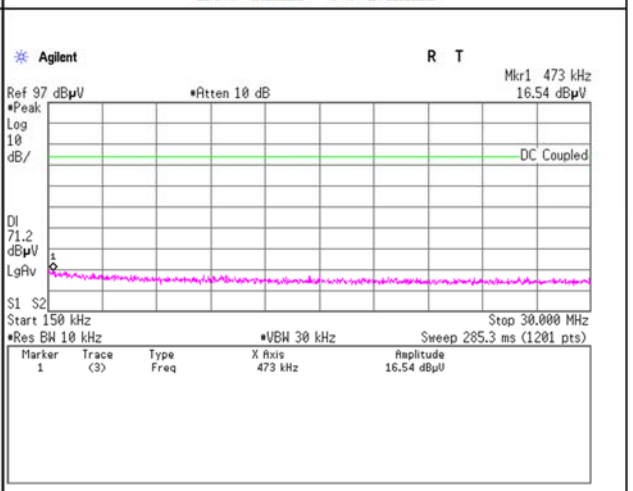
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off, DH5

2402 MHz

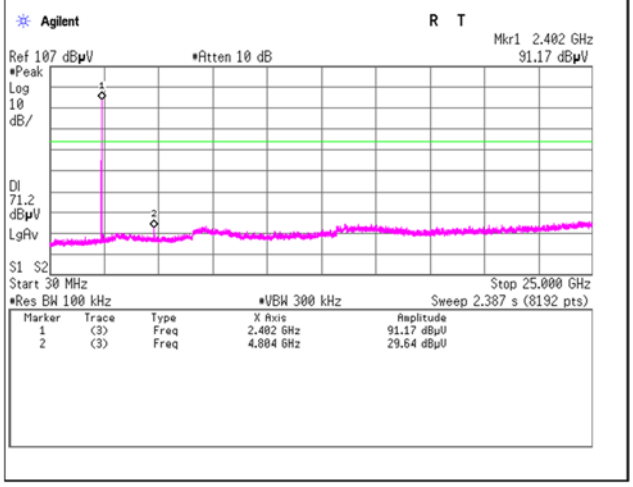
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

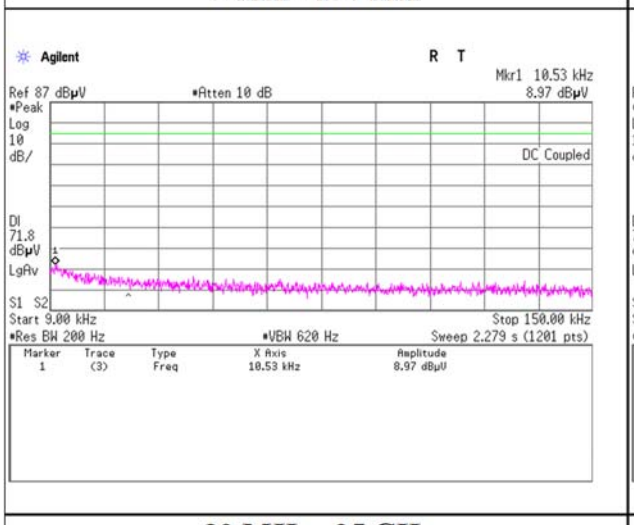


Conducted Spurious Emission

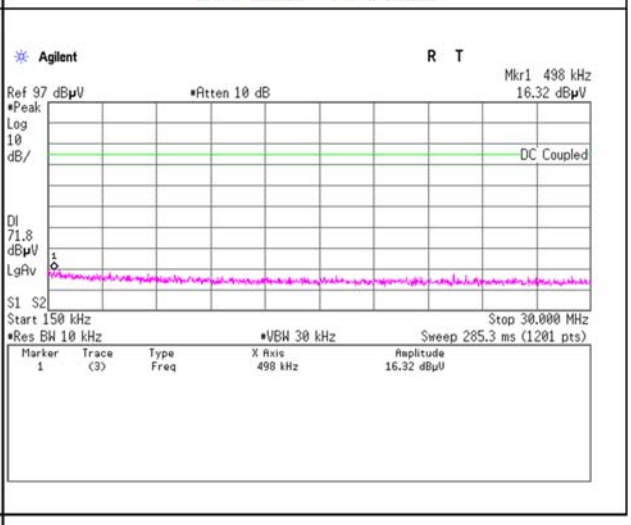
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off, DH5

2441 MHz

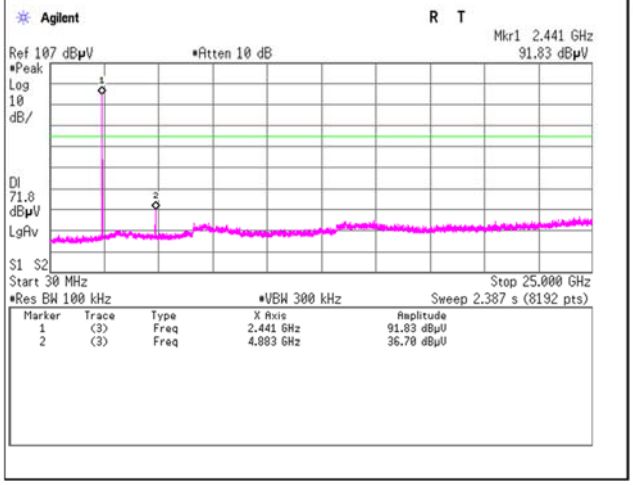
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

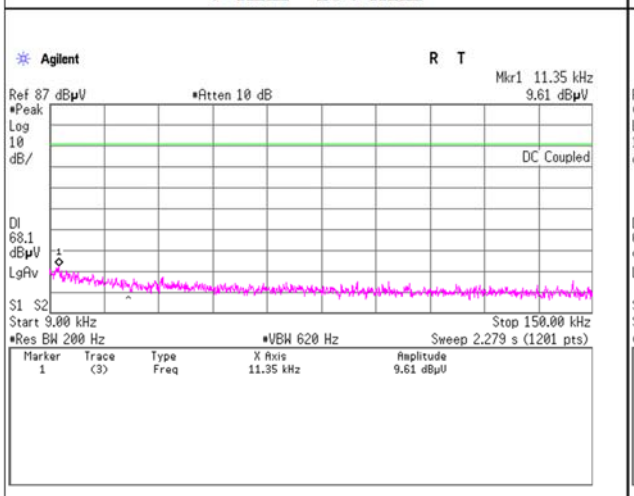


Conducted Spurious Emission

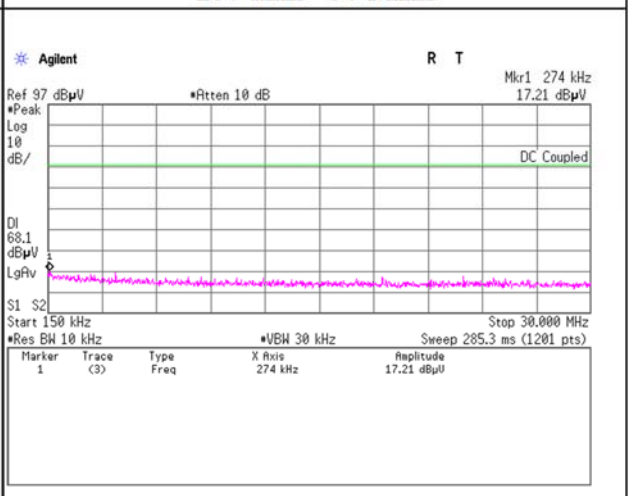
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off, DH5

2480 MHz

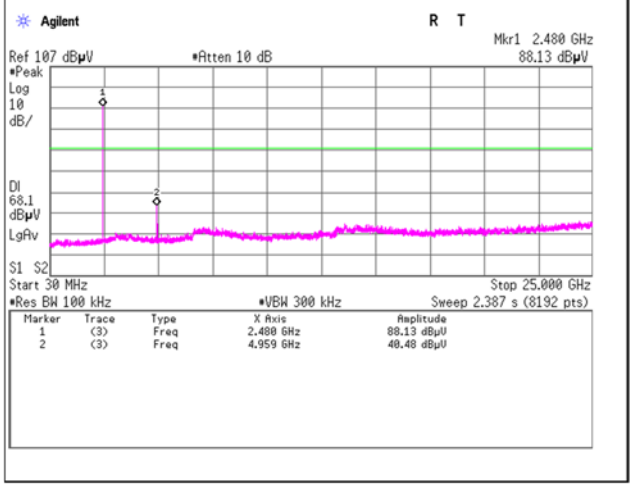
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

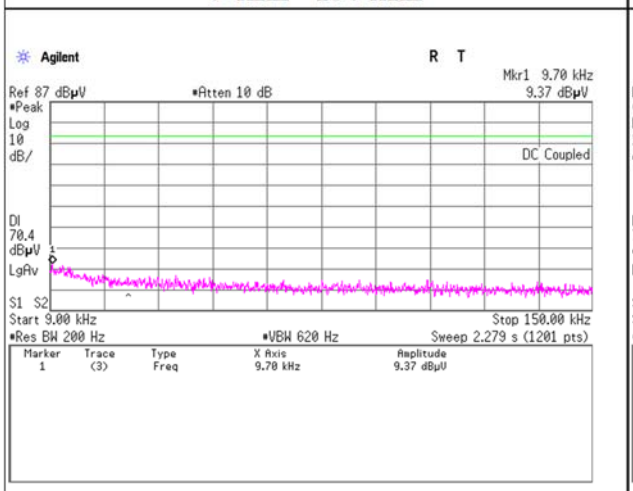


Conducted Spurious Emission

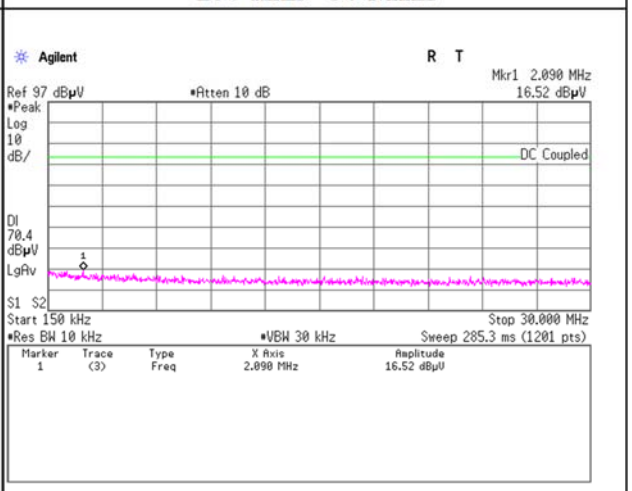
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off, 3DH5

2402 MHz

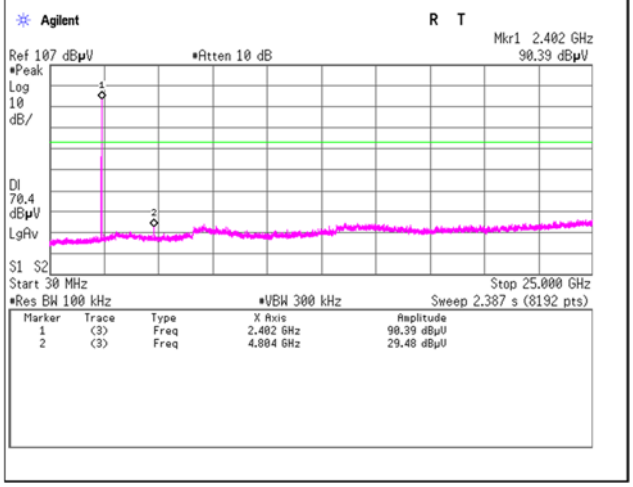
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

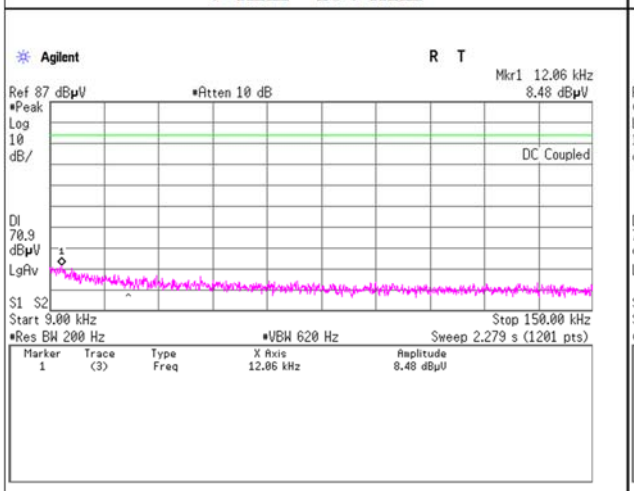


Conducted Spurious Emission

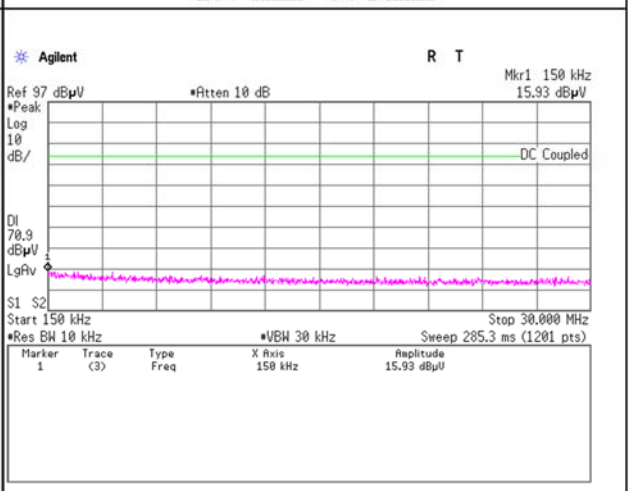
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off, 3DH5

2441 MHz

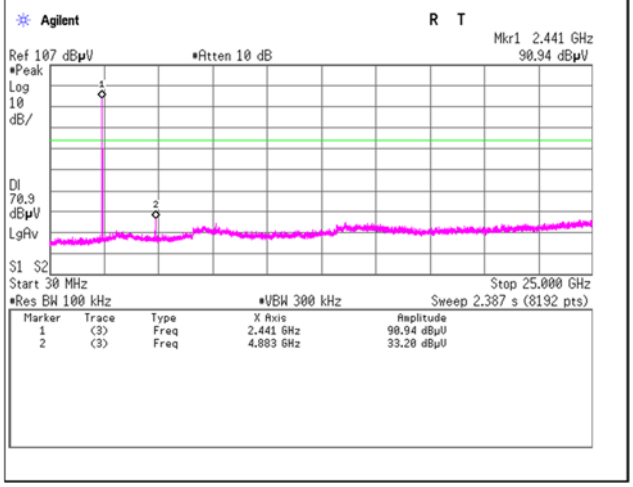
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

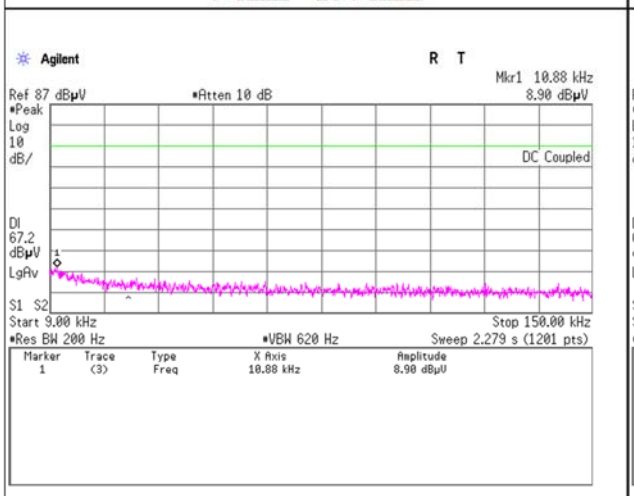


Conducted Spurious Emission

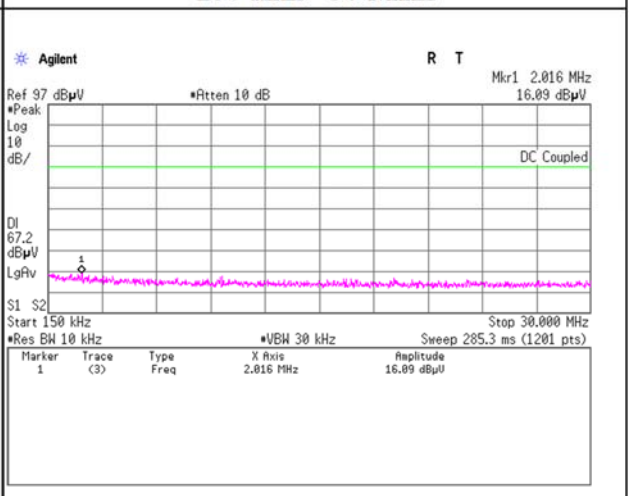
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off, 3DH5

2480 MHz

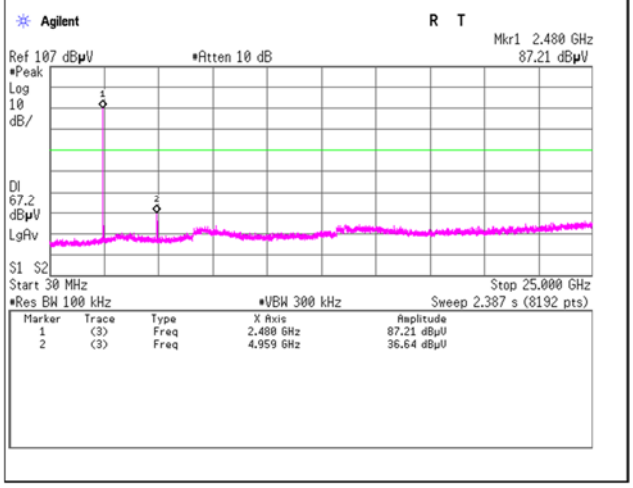
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

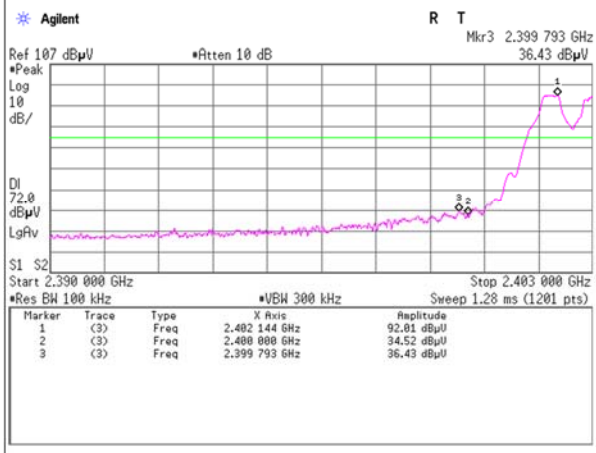


Conducted Emission Band Edge compliance

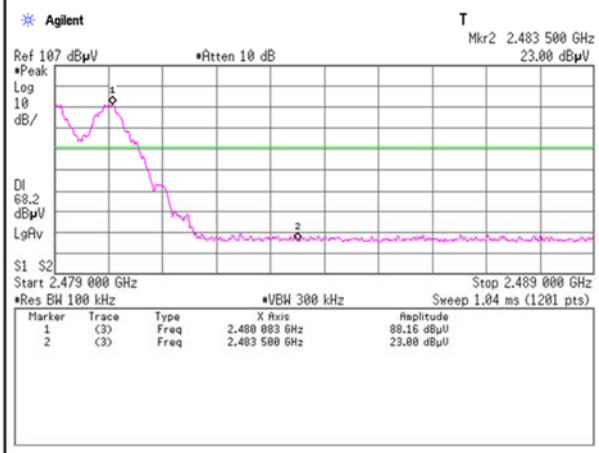
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx DH5

Hopping On

Low

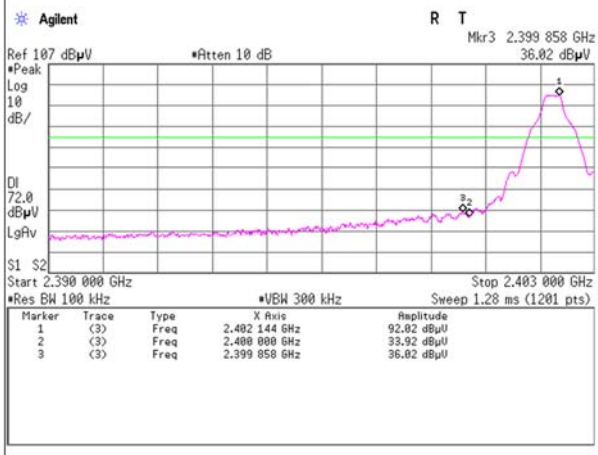


High

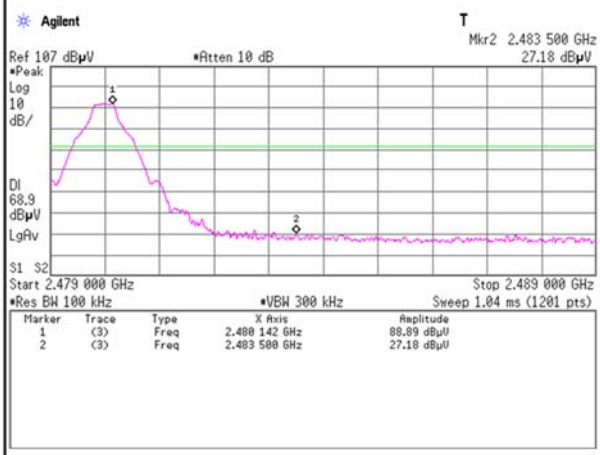


Hopping Off

Low



High

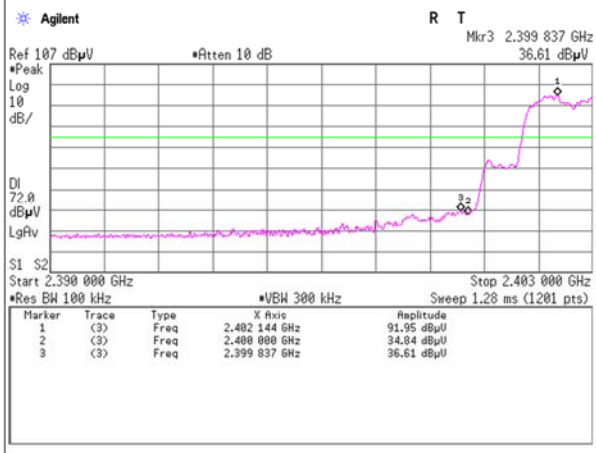


Conducted Emission Band Edge compliance

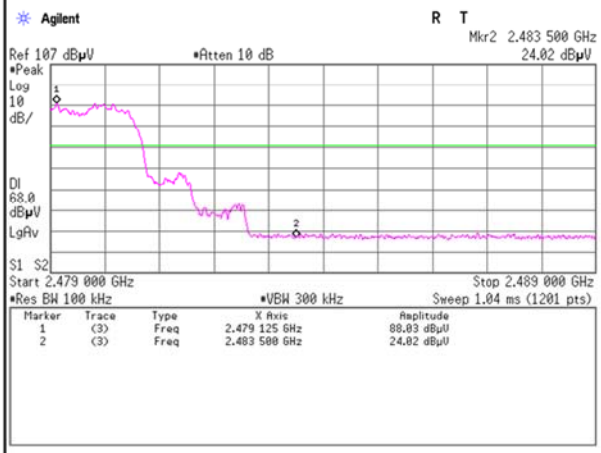
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2022
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Miku Ikudome
Mode	Tx 3DH5

Hopping On

Low

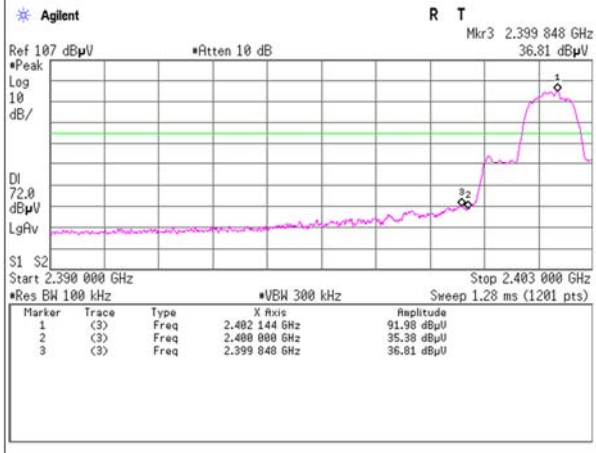


High

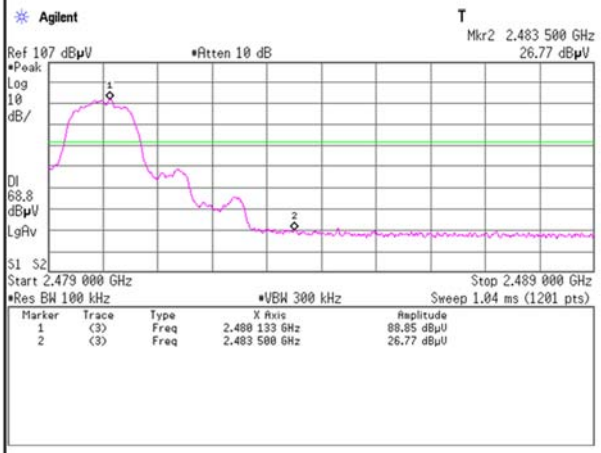


Hopping Off

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	SAT10-09	145132	Attenuator	Weinschel Corp.	54A-10	W5692	2021/10/05	12
AT	SCC-G13	145166	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	2021/12/06	12
AT	SOS-27	191845	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2022/01/25	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2022/01/25	12
AT	SRENT-15	160899	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185516	2022/02/02	12
AT	STM-G7	171614	Terminator	Weinschel - API Technologies Corp	M1459A	88995	2022/05/12	12
AT	STS-05	146212	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997828	2021/09/14	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	KJM-09	145929	Measure	KOMELON	KMC-36	-	-	-
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-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	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2021/10/05	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2022/02/21	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2022/02/21	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032665	2022/04/16	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/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
RE	SCC-G05	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2022/01/06	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2022/03/03	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2022/01/06	12
RE	SCC-G50	178573	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	MY13407/4E	2022/03/03	12
RE	SCC-G51	178572	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800288 /4A	2022/03/03	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2022/05/12	12
RE	SCC-G62	196985	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803650/2	2022/03/08	12
RE	SCC-G69	200009	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575617/4	2022/07/21	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2021/10/07	12

Test Equipment [2/2]

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SFL-03	145377	Highpass Filter	MICRO-TRONICS	HPM50112	28	2021/10/05	12
RE	SHA-01	145383	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-725	2022/03/01	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2022/06/06	12
RE	SHA-09	194684	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	695	2022/03/10	12
RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2022/04/16	12
RE	SOS-20	191837	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2022/05/17	12
RE	STR-01	145790	Test Receiver	Rohde & Schwarz	ESU40	100093	2022/04/28	12
RE	STS-01	145792	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997812	2021/09/14	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