RADIO TEST REPORT

Test Report No. 14671484S-A-R1

Customer	**Panasonic Automotive Systems Co., Ltd.**
Description of EUT	**Car Audio with Bluetooth**
Model Number of EUT	**AN2301**
FCC ID	**ACJ932AN2301**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**April 14, 2023**
Remarks	**-**

Representative Test Engineer	Approved By
H. Sato	S. Takano
Hiromasa Sato Engineer	Shinichi Takano Engineer

CERTIFICATE 1266.03

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

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

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- The information provided from the customer for this report is identified in Section 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No.: 14671484S-A

This report is a revised version of 14671484S-A. 14671484S-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14671484S-A	March 23, 2023	-
1	14671484S-A-R1	April 14, 2023	P.1 Correction of FCC ID From: ACJAN2301, To: ACJ932AN2301
			P.6 Correction of Worst margin mode From: 3DH5 2480 MHz with 11n-20 MIMO 5745 MHz To: Tx, 3DH5 2480 MHz

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	Panasonic Automotive Systems Co., Ltd. *1)
Address	4261, Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanaga-ken 224-8520, Japan
Telephone Number	+81 50-3689-7112
Contact Person	Teruyuki Miura

*1) The Grantee name in the FCC application is “Panasonic Corporation of North America”.

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	Car Audio with Bluetooth
Model Number	AN2301
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	February 7, 2023
Test Date	February 16 to 20, 2023

2.2 Product Description

General Specification

Rating	DC 13.2 V
Operating temperature	-30 deg. C to +70 deg. C

Radio Specification

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS, GFSK, π/4 DQPSK, 8 DPSK
Antenna Gain	-2.2 dBi(MAX)

FM tuner specification

Frequency of operation	87.9 MHz to 107.9 MHz
Intermediate frequency	388 kHz

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(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)	5.7 dB 198.883 MHz, QP, Hori. Mode: Tx, 3DH5 2480 MHz	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 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)

FCC Part 15.31 (e)

The equipment provides the wireless transmitter with stable power supply.
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

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users. 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:** -	-	Complied 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 $k = 2$.

Shonan EMC Lab.

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	0.84 dB
Conducted emissions Power Density Measurement 1 GHz-3 GHz	0.86 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

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: SYSTEM Ver.: 001
(Date: 2023.02.16 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)

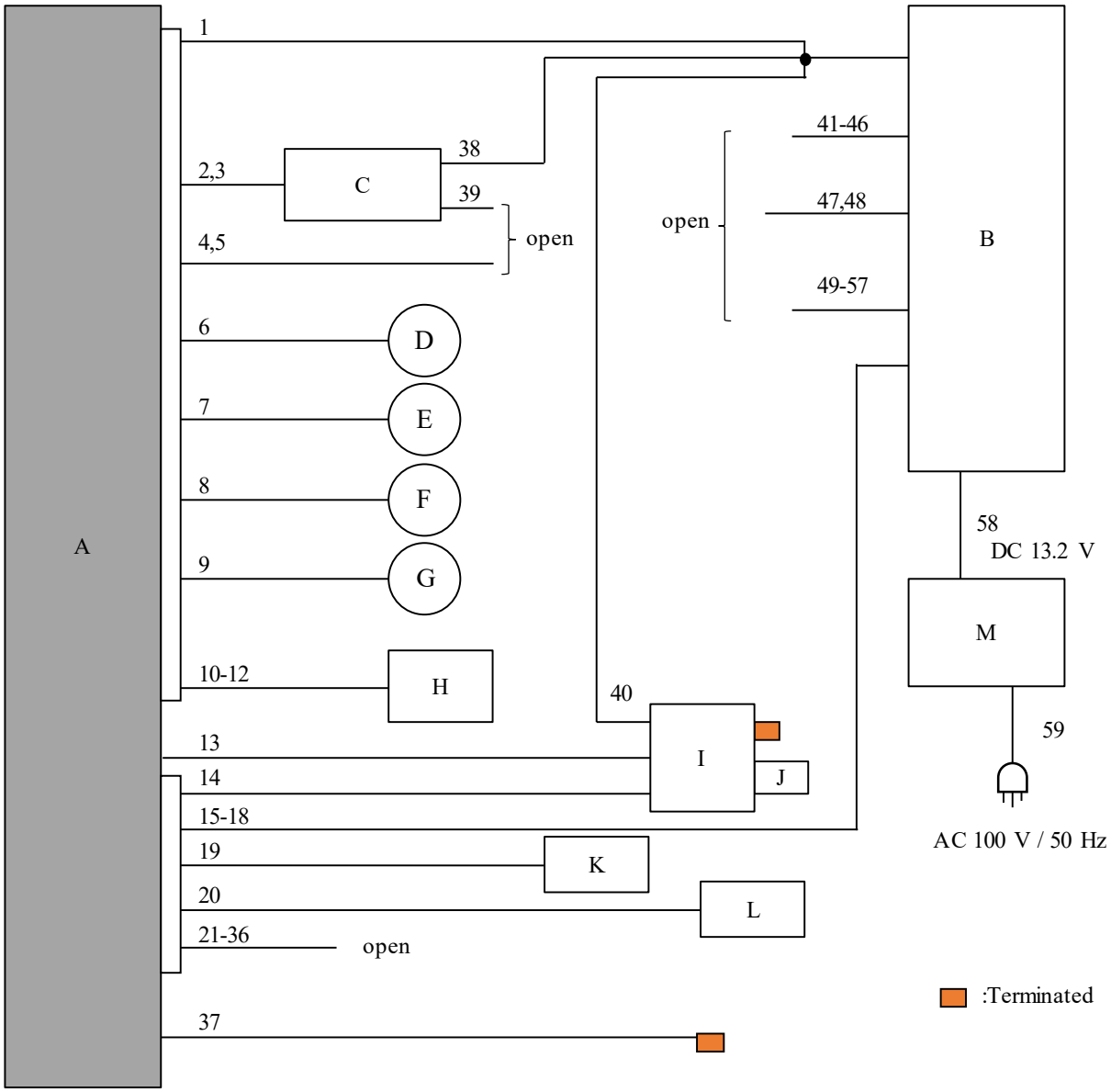
Test Item	Mode	Hopping	Tested Frequency
Radiated Spurious Emission (Below 1 GHz)	Tx 3DH5 *1)	Off	2441 MHz
Radiated Spurious Emission (Above 1 GHz)	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Conducted Spurious Emission	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx DH5 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.

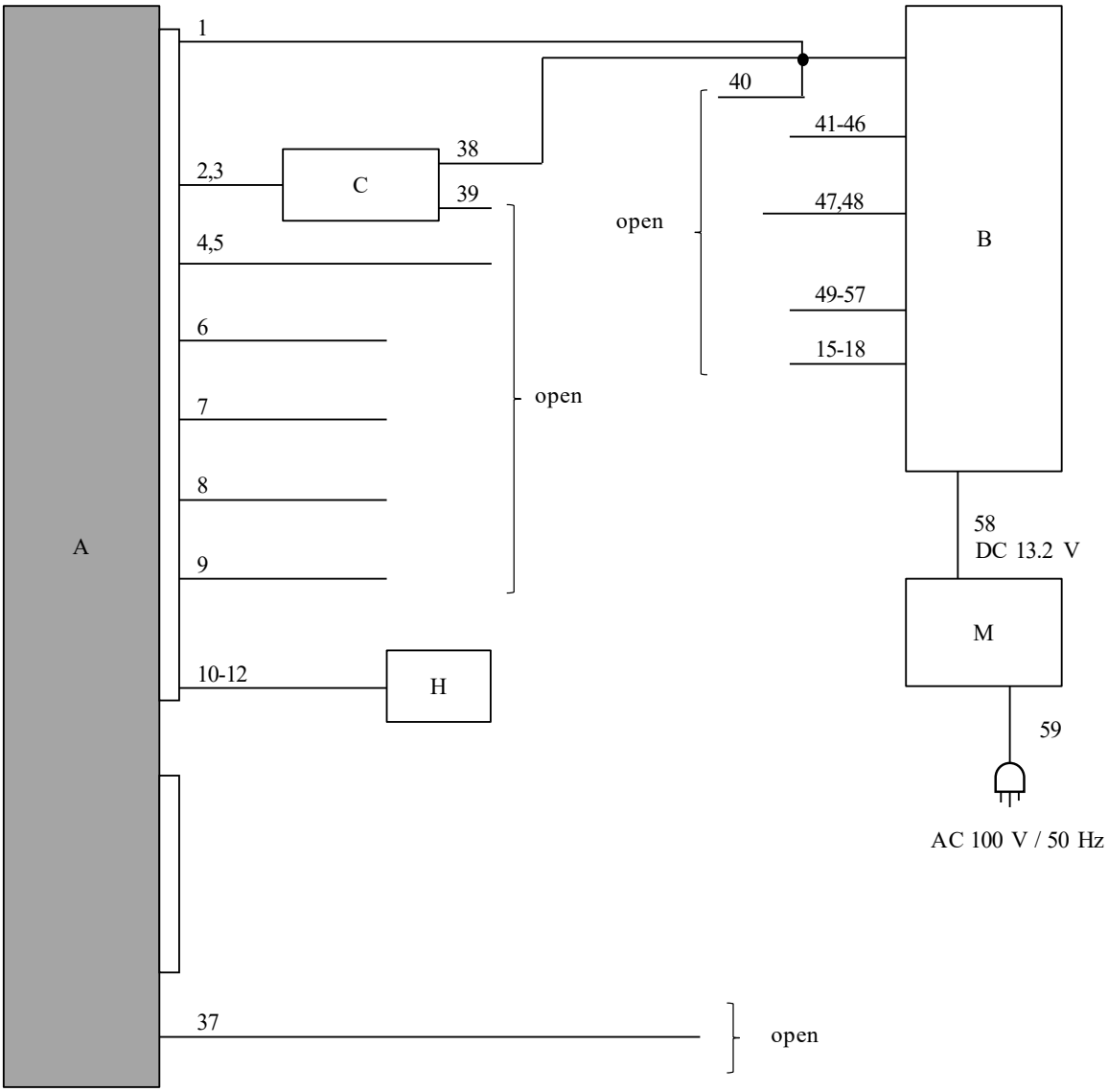
*1) Radiated Spurious emissions (Below 1 GHz) were limited to the channel that had the highest power during the antenna terminal test, as preliminary testing indicated that changing the operating frequency had no significant impact on the emissions in those frequency bands.

4.2 Configuration and Peripherals

<Radiated Emission test>



<Antenna Terminal Conducted test>



Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Car Audio with Bluetooth	AN2301	15LDA-Z1S239 *1) 15LDA-Z1S240 *2)	Panasonic	EUT
B	SW BOX Ver3	ALL IN 1 SW BOX Ver.3	-	-	-
C	VCAN JIG	VCAN JIG	NV1-JIG040	-	-
D	Speaker	TS-F1030	V44QAH2	Pioneer	-
E	Speaker	TS-F1030	V44QAH2	Pioneer	-
F	Speaker	TS-F1030	V44QBA1	Pioneer	-
G	Speaker	TS-F1030	V44QBA1	Pioneer	-
H	ST Switch Board	STRG-SW 6-LEVEL	No.083	-	-
I	USB HUB	284H3 5FA0A	690510125C	-	-
J	USB Memory	USM4GL-W	-	SONY	-
K	Rear Camera	GP-KD5603RD	24C01221	-	-
L	Mic	28336 5AA0A	150819001768	-	-
M	Power Supply(DC)	PAN35-10A	BP002287	KIKUSUI	-

*1) Used for Antenna Terminal conducted test
*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	1.0 + 0.5	Unshielded	Unshielded	+B, ACC, GND
2	VCAN_H	1.0 + 1.0	Unshielded	Unshielded	-
3	VCAN_L	1.0 + 1.0	Unshielded	Unshielded	-
4	ILL(+)	1.0	Unshielded	Unshielded	-
5	SPD	1.0	Unshielded	Unshielded	-
6	Speaker	1.0 + 2.0 + 0.15	Unshielded	Unshielded	-
7	Speaker	1.0 + 2.0 + 0.15	Unshielded	Unshielded	-
8	Speaker	1.0 + 2.0 + 0.15	Unshielded	Unshielded	-
9	Speaker	1.0 + 2.0 + 0.15	Unshielded	Unshielded	-
10	STRG_SW_A	1.0 + 0.5	Unshielded	Unshielded	-
11	STRG_SW_B	1.0 + 0.5	Unshielded	Unshielded	-
12	STRG_SW_SHIELD	1.0 + 0.5	Unshielded	Unshielded	-
13	USB	1.3	Shielded	Shielded	-
14	Signal	1.0	Unshielded	Unshielded	-
15	EQ1	1.0 + 0.5	Unshielded	Unshielded	-
16	EQ2	1.0 + 0.5	Unshielded	Unshielded	-
17	EQ3	1.0 + 0.5	Unshielded	Unshielded	-
18	EQ4	1.0 + 0.5	Unshielded	Unshielded	-
19	Rear Camera	1.0 + 0.15	Unshielded	Unshielded	-
20	Mic	1.0 + 0.1	Unshielded	Unshielded	-
21	ILL_CONT	1.0	Unshielded	Unshielded	-
22	IGN	1.0	Unshielded	Unshielded	-
23	Door Open	1.0	Unshielded	Unshielded	-
24	REVERSE	1.0	Unshielded	Unshielded	-
25	AUTOACC2(CMF1)	1.0	Unshielded	Unshielded	-
26	MR_OUTPUT	1.0	Unshielded	Unshielded	-
27	CAMERA_SW	1.0	Unshielded	Unshielded	-
28	Camera_DET	1.0	Unshielded	Unshielded	-
29	Camera Switching input(for AVM)	1.0	Unshielded	Unshielded	-
30	Camera Off(For AVM)	1.0	Unshielded	Unshielded	-
31	AVM_DET	1.0	Unshielded	Unshielded	-
32	TEL input+	1.0	Unshielded	Unshielded	-
33	TEL input-	1.0	Unshielded	Unshielded	-
34	TEL MUTE	1.0	Unshielded	Unshielded	-
35	M-CAN_H	1.0 + 0.1	Unshielded	Unshielded	-
36	M-CAN_L	1.0 + 0.1	Unshielded	Unshielded	-
37	FM	0.15 + 2.0	Shielded	Shielded	-
38	DC	1.0 + 0.5	Unshielded	Unshielded	+B, GND
39	Signal	1.0	Unshielded	Unshielded	-

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
40	DC	1.0 + 0.5	Unshielded	Unshielded	+B, GND
41	Signal	0.5	Unshielded	Unshielded	-
42	Signal	0.5	Unshielded	Unshielded	-
43	AutoACC	0.5	Unshielded	Unshielded	-
44	AMP ON	0.5	Unshielded	Unshielded	-
45	ILL+	0.5	Unshielded	Unshielded	-
46	ILL-	0.5	Unshielded	Unshielded	-
47	CAMERA Power	0.5 + 1.0	Unshielded	Unshielded	-
48	CAMERA GND	0.5 + 1.0	Unshielded	Unshielded	-
49	CAMERA SW	0.5	Unshielded	Unshielded	-
50	CAMERA SW IN	0.5	Unshielded	Unshielded	-
51	CAMERA OFF	0.5	Unshielded	Unshielded	-
52	CAM6.2V	0.5	Unshielded	Unshielded	-
53	CAM DET	0.5	Unshielded	Unshielded	-
54	CAM GND	0.5	Unshielded	Unshielded	-
55	TEL ON	0.5	Unshielded	Unshielded	-
56	AVM DET	0.5	Unshielded	Unshielded	-
57	REVERS	0.5	Unshielded	Unshielded	-
58	DC	0.5 + 2.0	Unshielded	Unshielded	-
59	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, 0.5 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. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

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

Test Antennas are used as below;

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

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

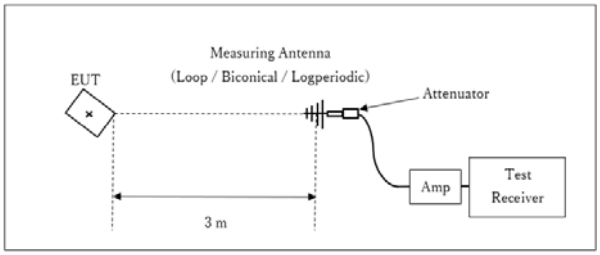
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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

*1) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector used Duty cycle correction factor (DCCF).

Figure 2: Test Setup

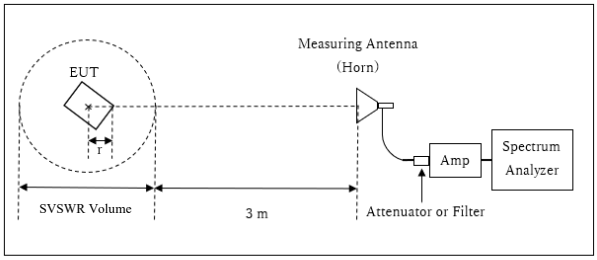
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

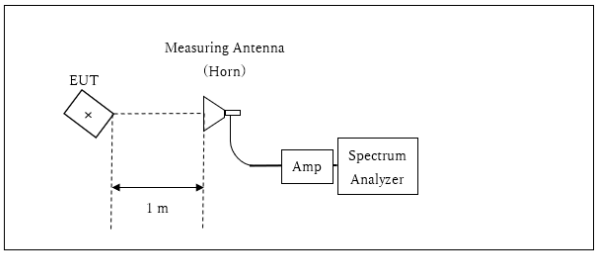


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.86 m / 3.0 m) = 2.19 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.86 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.14 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 test was made on EUT at the normal use position (5 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	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	13 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

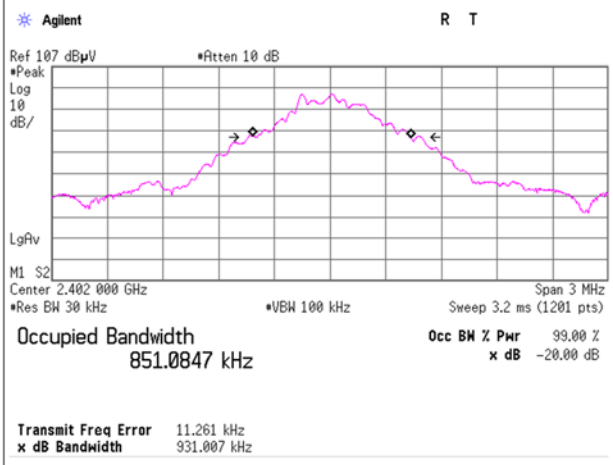
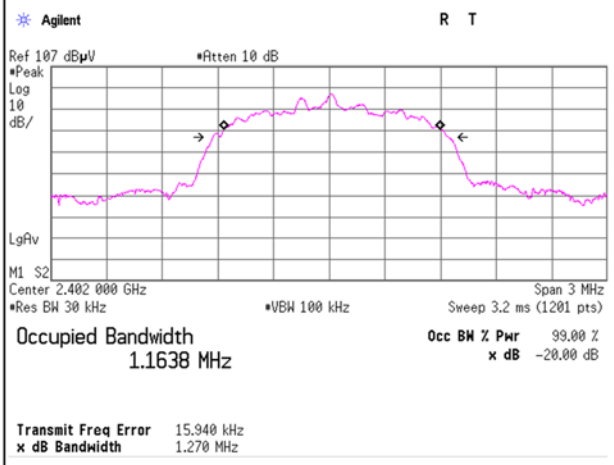
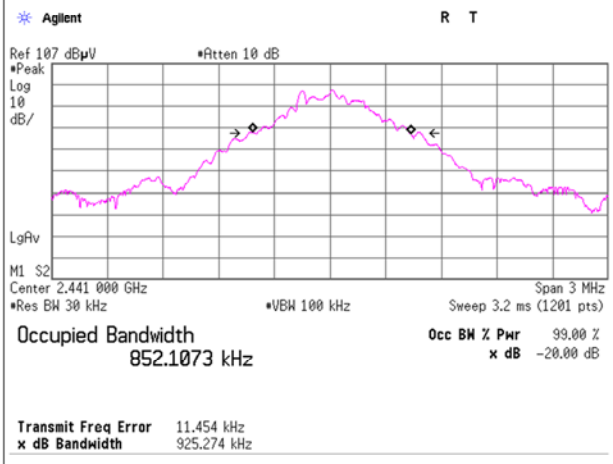
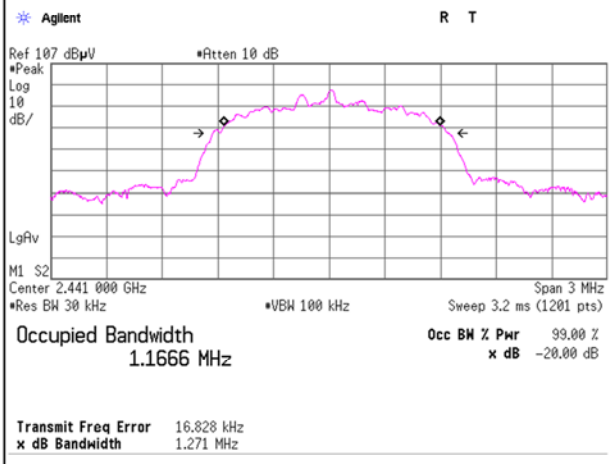
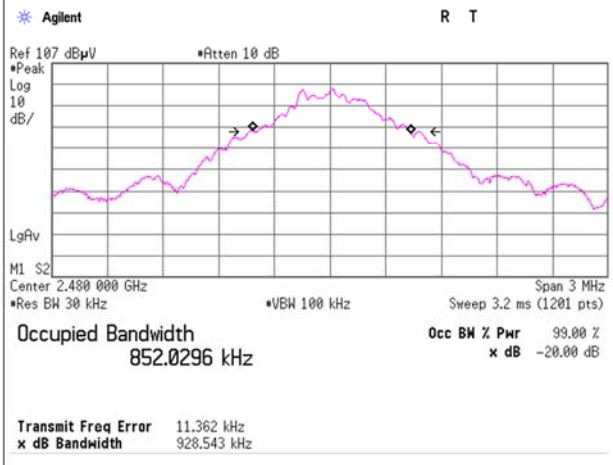
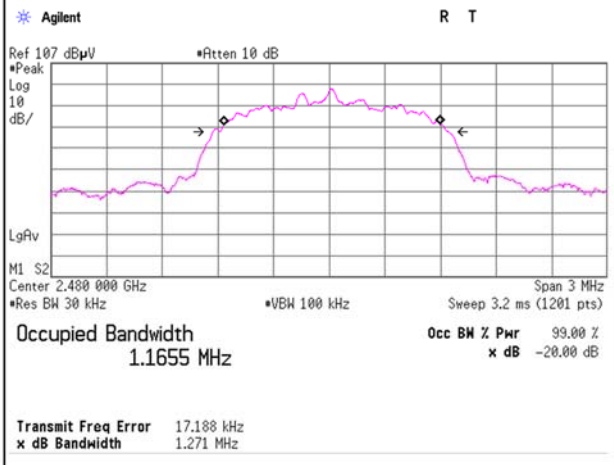
20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off, Tx, Hopping On

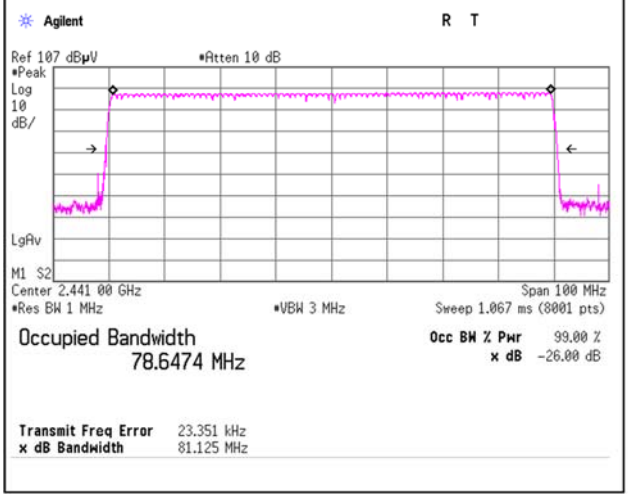
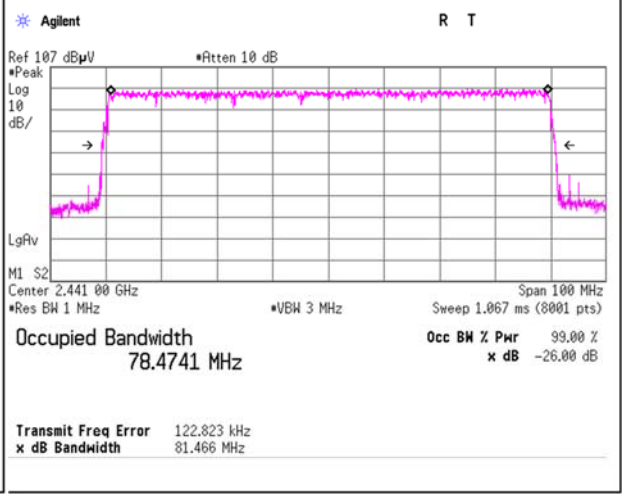
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.931	851.1	2400.250	>= 0.621
DH5	2441.0	0.925	852.1	2440.500	>= 0.617
DH5	2480.0	0.929	852.0	2478.750	>= 0.619
DH5	Hopping On	-	78647.4	-	-
3DH5	2402.0	1.270	1163.8	2402.250	>= 0.847
3DH5	2441.0	1.271	1166.6	2438.500	>= 0.847
3DH5	2480.0	1.271	1165.5	2478.750	>= 0.847
3DH5	Hopping On	-	78474.1	-	-

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

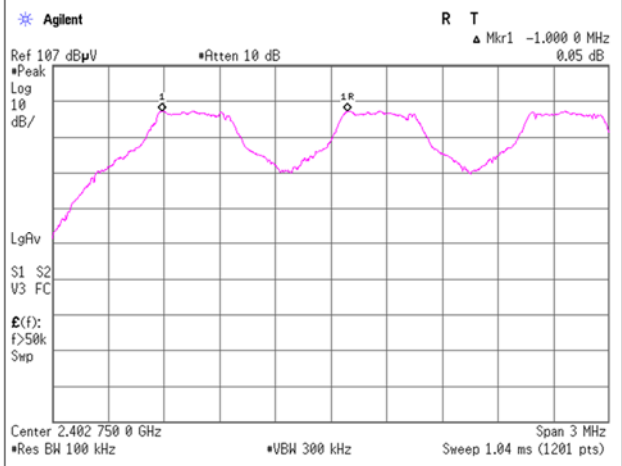
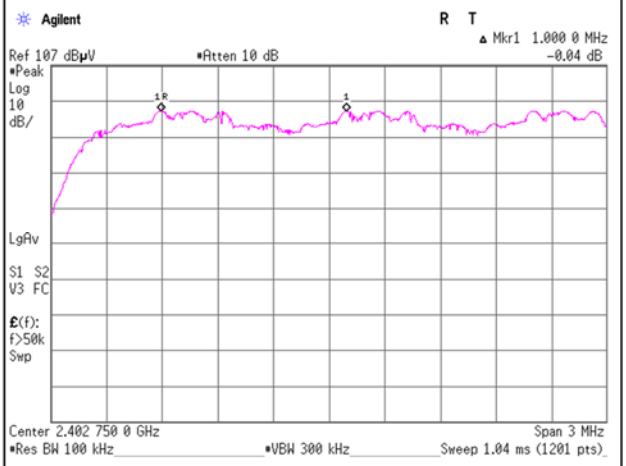
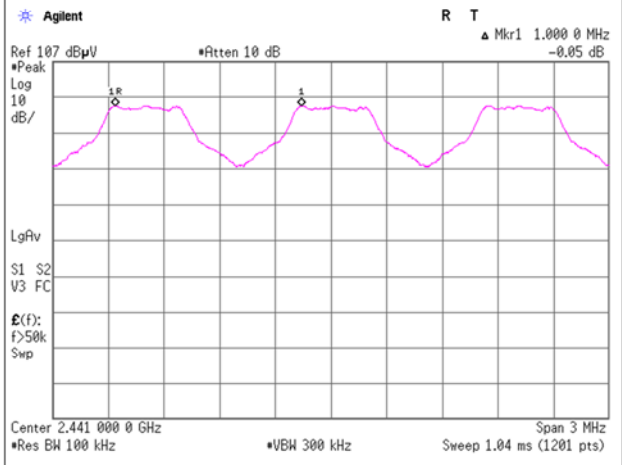
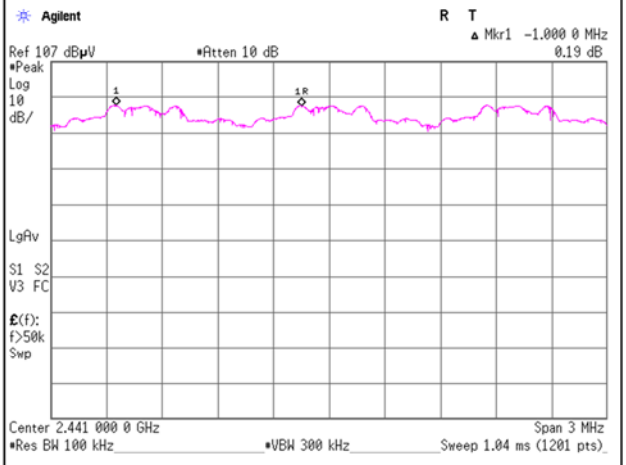
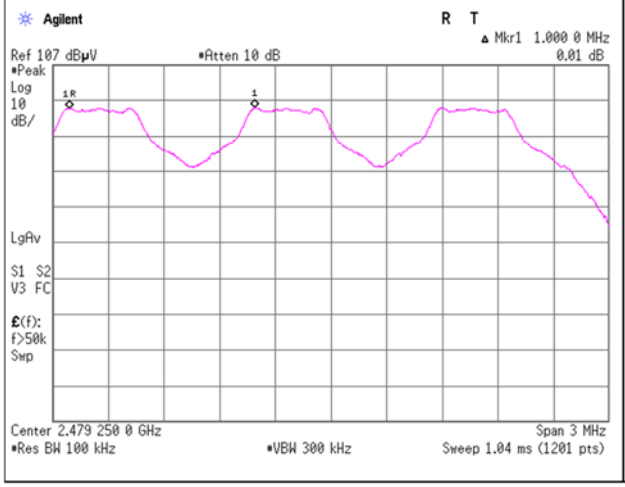
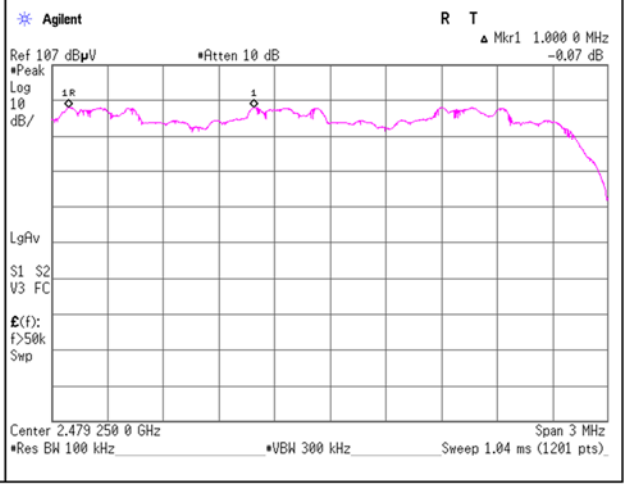
20dB Bandwidth and 99% Occupied Bandwidth

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

20dB 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
	

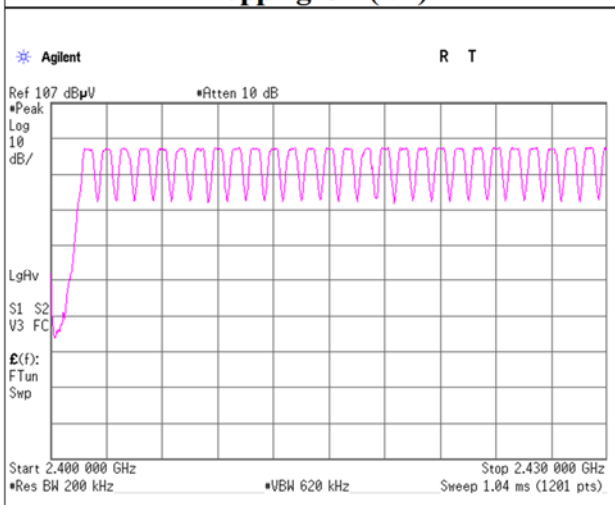
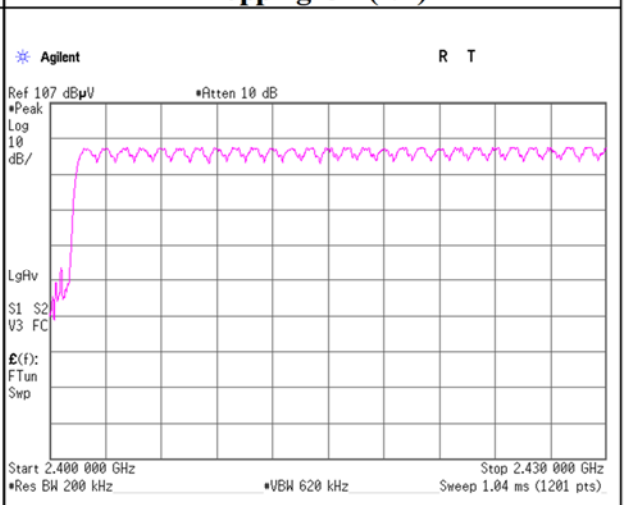
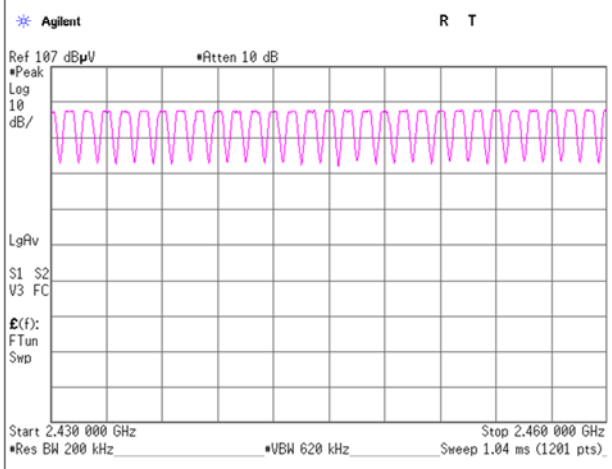
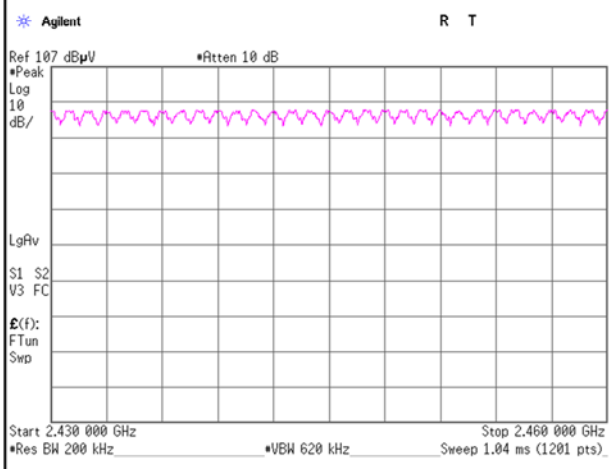
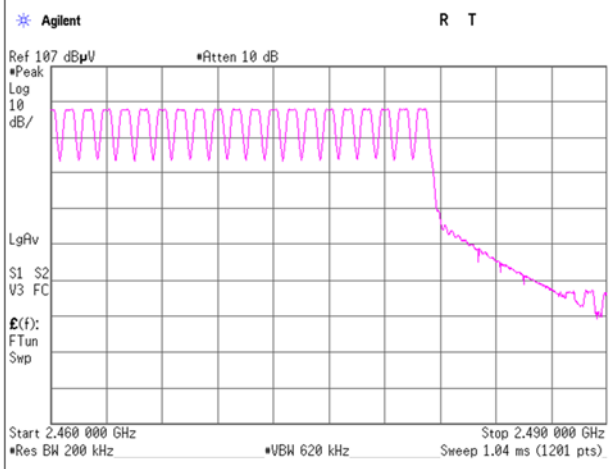
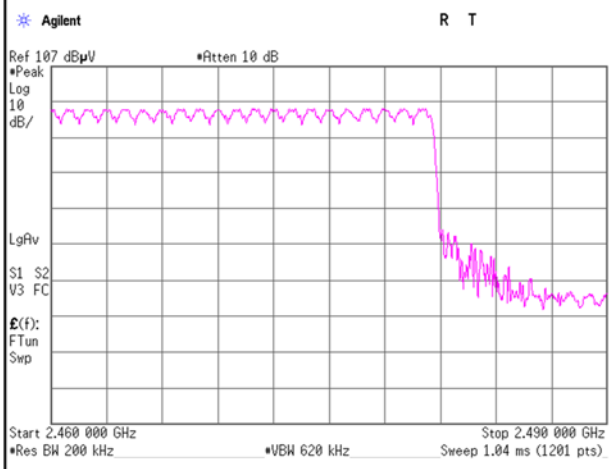
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
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	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
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	50.4 times	/ 5 s	x 31.6 s	= 319 times	0.460	147	400
DH3	27.4 times	/ 5 s	x 31.6 s	= 174 times	1.713	298	400
DH5	20.6 times	/ 5 s	x 31.6 s	= 131 times	2.965	388	400
3DH1	50.8 times	/ 5 s	x 31.6 s	= 322 times	0.456	147	400
3DH3	28.4 times	/ 5 s	x 31.6 s	= 180 times	1.707	307	400
3DH5	21.2 times	/ 5 s	x 31.6 s	= 134 times	2.955	396	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.

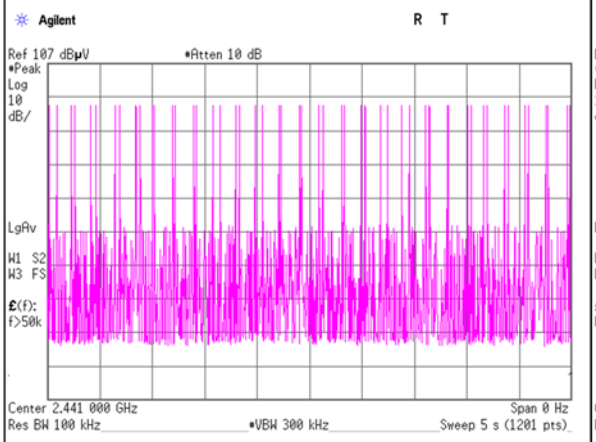
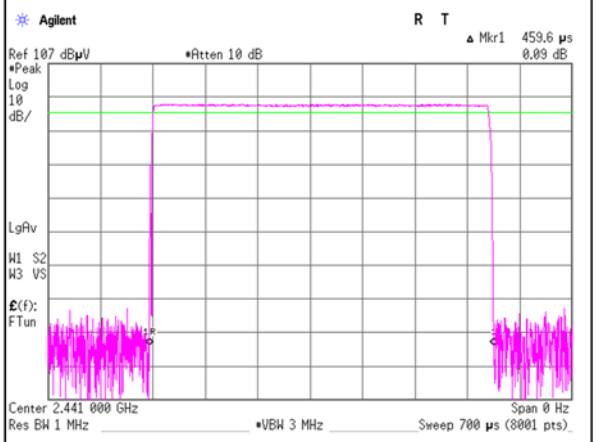
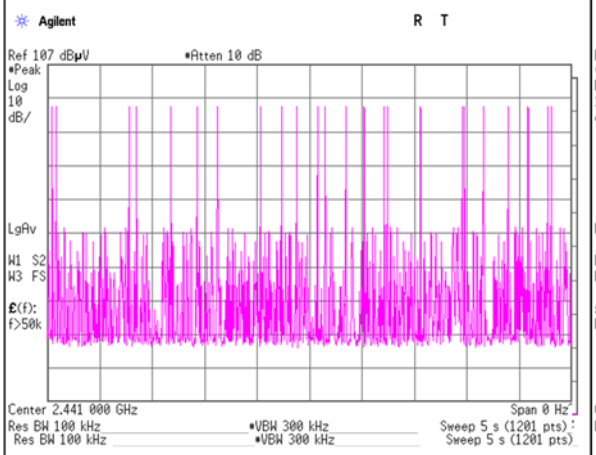
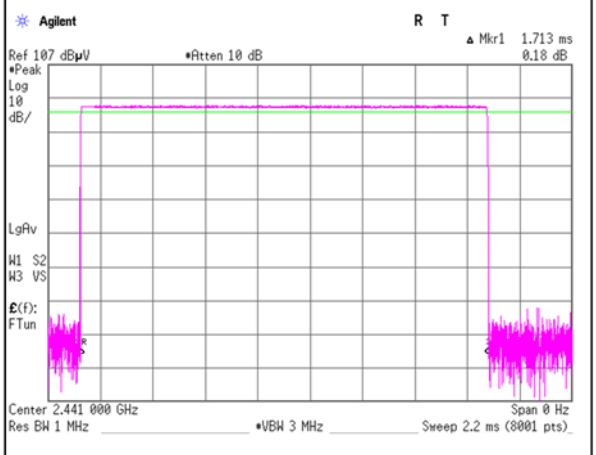
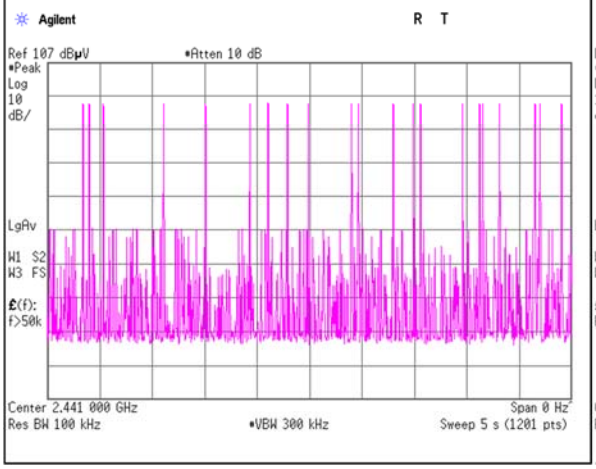
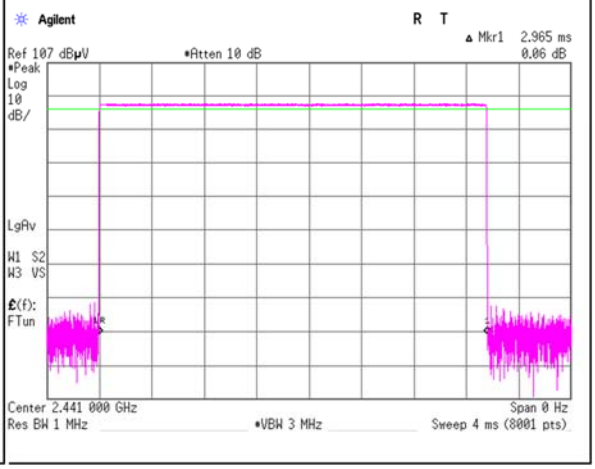
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	52	50	50	50	50	50.4
DH3	30	25	24	28	30	27.4
DH5	21	19	20	20	23	20.6
3DH1	51	51	52	50	50	50.8
3DH3	28	23	28	31	32	28.4
3DH5	19	22	20	21	24	21.2

Sample Calculation

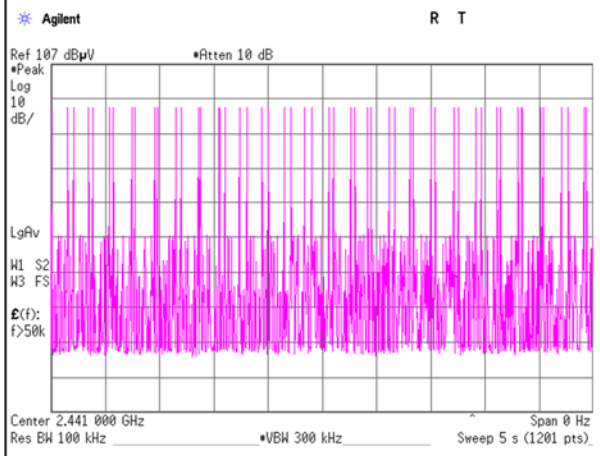
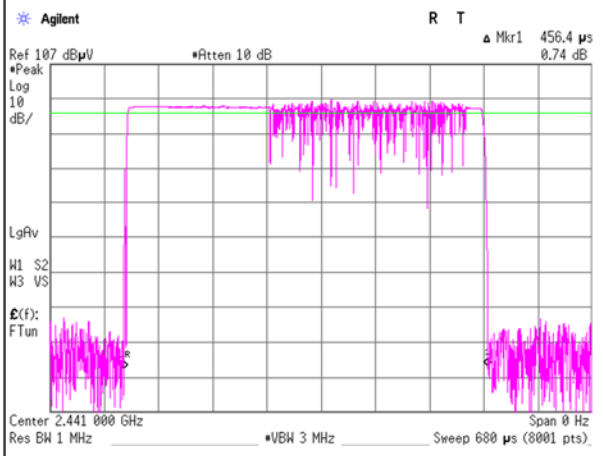
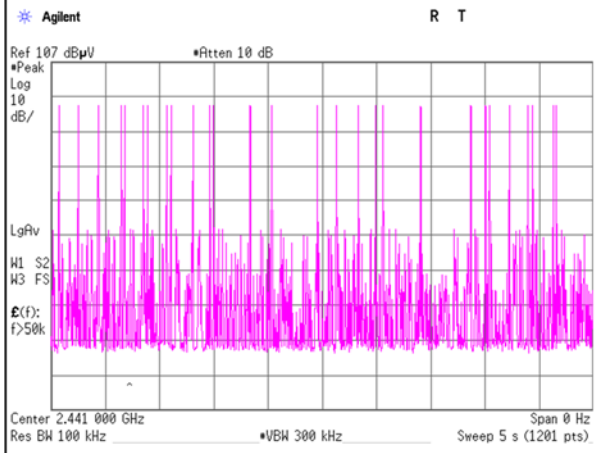
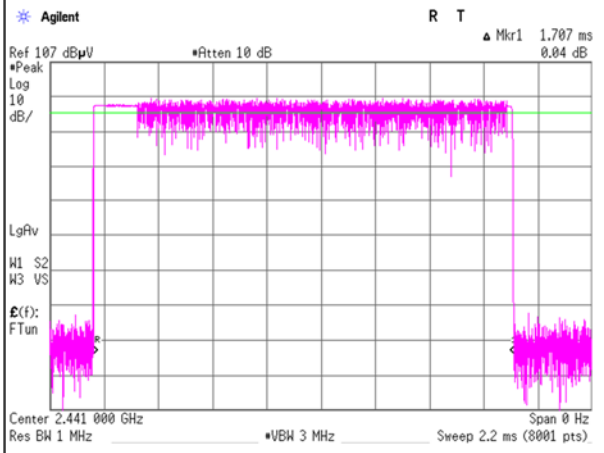
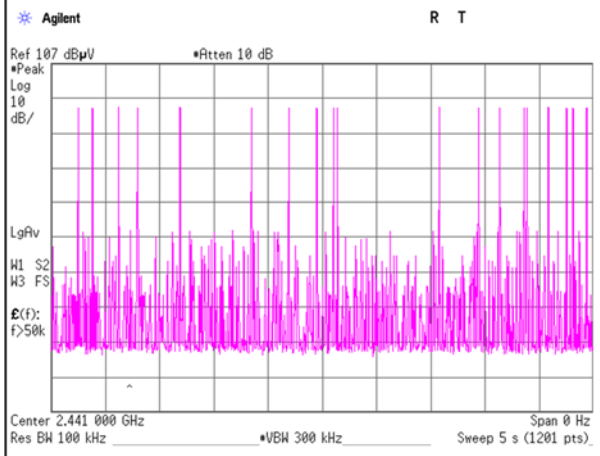
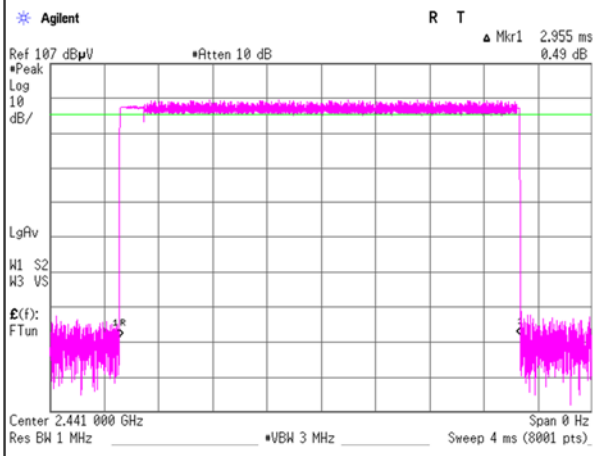
Average = Summation (Sampling 1 to 5) / 5

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	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % 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	-12.13	2.80	9.88	0.55	1.14	20.97	125	20.42	-2.20	-1.65	0.68	36.02	4000	37.67
DH5	2441	-11.78	2.81	9.88	0.91	1.23	20.97	125	20.06	-2.20	-1.29	0.74	36.02	4000	37.31
DH5	2480	-11.36	2.81	9.89	1.34	1.36	20.97	125	19.63	-2.20	-0.86	0.82	36.02	4000	36.88
2DH5	2402	-10.51	2.80	9.88	2.17	1.65	20.97	125	18.80	-2.20	-0.03	0.99	36.02	4000	36.05
2DH5	2441	-10.19	2.81	9.88	2.50	1.78	20.97	125	18.47	-2.20	0.30	1.07	36.02	4000	35.72
2DH5	2480	-9.87	2.81	9.89	2.83	1.92	20.97	125	18.14	-2.20	0.63	1.16	36.02	4000	35.39
3DH5	2402	-9.86	2.80	9.88	2.82	1.91	20.97	125	18.15	-2.20	0.62	1.15	36.02	4000	35.40
3DH5	2441	-9.65	2.81	9.88	3.04	2.01	20.97	125	17.93	-2.20	0.84	1.21	36.02	4000	35.18
3DH5	2480	-9.57	2.81	9.89	3.13	2.06	20.97	125	17.84	-2.20	0.93	1.24	36.02	4000	35.09

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	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % 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	-13.77	2.80	9.88	-1.09	0.78	1.03	-0.06	0.99
DH5	2441	-13.43	2.81	9.88	-0.74	0.84	1.03	0.29	1.07
DH5	2480	-13.11	2.81	9.89	-0.41	0.91	1.03	0.62	1.15
2DH5	2402	-14.25	2.80	9.88	-1.57	0.70	1.03	-0.54	0.88
2DH5	2441	-13.98	2.81	9.88	-1.29	0.74	1.03	-0.26	0.94
2DH5	2480	-13.65	2.81	9.89	-0.95	0.80	1.03	0.08	1.02
3DH5	2402	-14.22	2.80	9.88	-1.54	0.70	1.03	-0.51	0.89
3DH5	2441	-13.92	2.81	9.88	-1.23	0.75	1.03	-0.20	0.96
3DH5	2480	-13.93	2.81	9.89	-1.23	0.75	1.03	-0.20	0.96

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

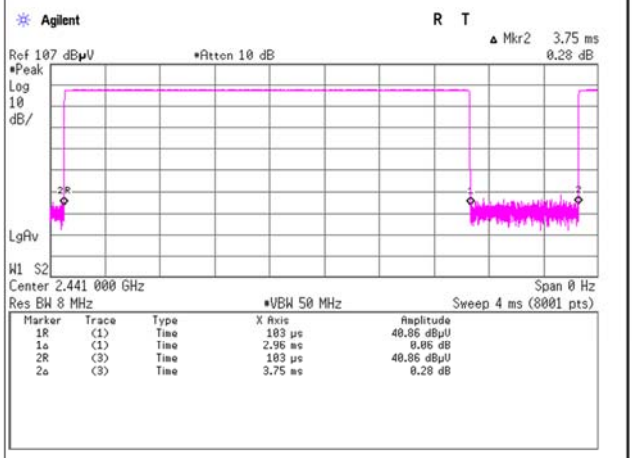
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off

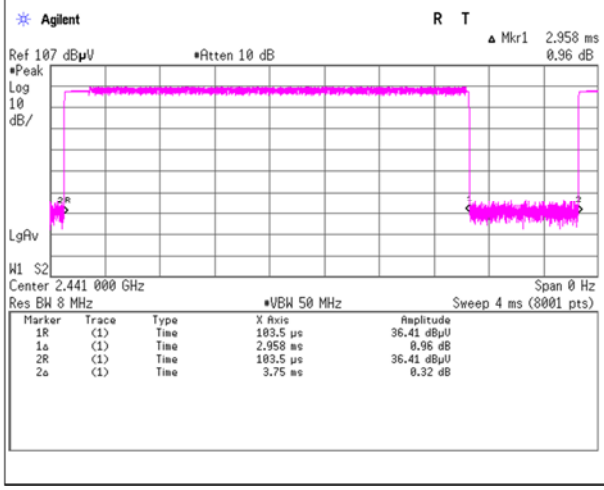
DH5

Tx on / (Tx on + Tx off) =	**0.789**
Tx on / (Tx on + Tx off) * 100 =	**78.9 %**
Duty factor = 10 * log (3.75 / 2.96) =	**1.03 dB**
VBW: 1 / on time = 337.83 Hz <	**360.00 Hz**



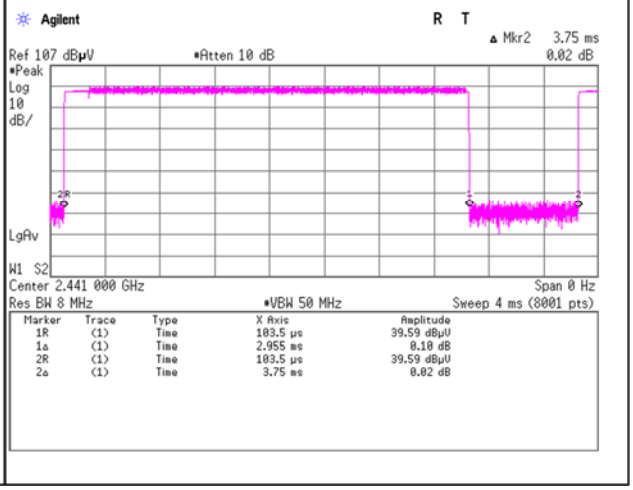
2DH5

Tx on / (Tx on + Tx off) =	**0.789**
Tx on / (Tx on + Tx off) * 100 =	**78.9 %**
Duty factor = 10 * log (3.75 / 2.958) =	**1.03 dB**
VBW: 1 / on time = 338.12 Hz <	**360.00 Hz**



3DH5

Tx on / (Tx on + Tx off) =	**0.788**
Tx on / (Tx on + Tx off) * 100 =	**78.8 %**
Duty factor = 10 * log (3.75 / 2.955) =	**1.03 dB**
VBW: 1 / on time = 338.47 Hz <	**360.00 Hz**



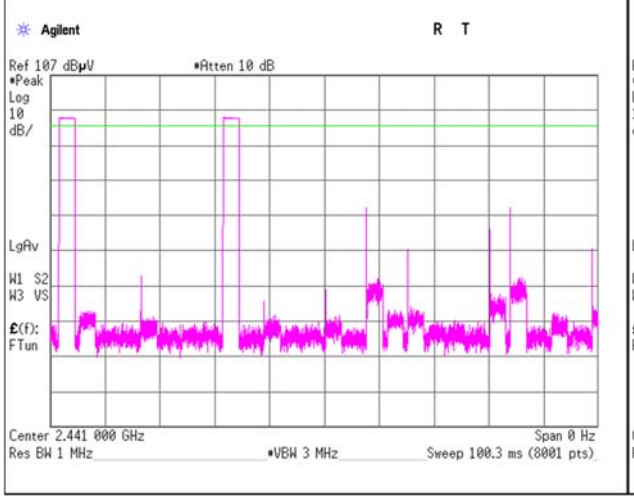
Duty cycle correction factor

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping On

DH5

Tx On time **2.961 ms**

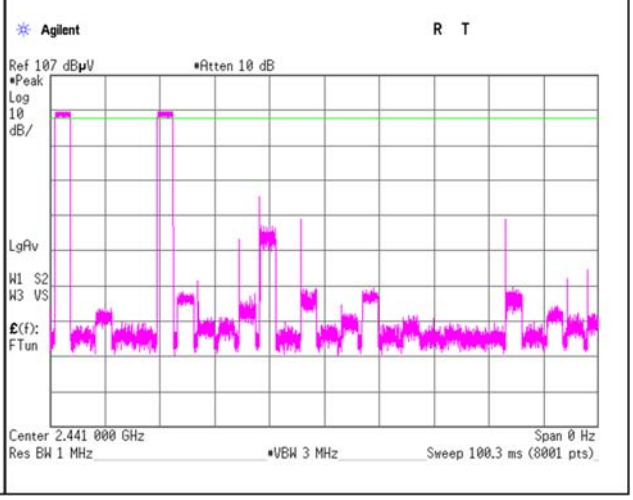
Dwell time factor = 20 x log (2.961 x 2 / 100) = -24.55 dB



3DH5

Tx On time **2.955 ms**

Dwell time factor = 20 x log (2.955 x 2 / 100) = -24.57 dB



Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	February 19, 2023	February 20, 2023
Temperature / Humidity	25 deg. C / 32 % RH	25 deg. C / 30 % RH
Engineer	Hiromasa Sato	Hiromasa Sato
	(1 GHz -10 GHz)	(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.	2375.960	PK	49.52	28.21	14.29	41.63	2.19	52.58	73.9	21.3	155	52	-
Hori.	2390.000	PK	47.52	28.18	14.30	41.63	2.19	50.56	73.9	23.3	155	52	-
Hori.	4804.000	PK	47.57	31.54	7.07	42.87	2.19	45.50	73.9	28.4	150	0	-
Hori.	7206.000	PK	56.00	37.37	8.39	43.39	2.19	60.56	73.9	13.3	202	33	-
Hori.	9608.000	PK	47.20	38.89	9.59	43.21	2.19	54.66	73.9	19.2	150	0	-
Hori.	4804.000	AV	36.16	31.54	7.07	42.87	2.19	34.09	53.9	19.8	150	0	VBW: 360 Hz,Floor noise
Hori.	9608.000	AV	35.66	38.89	9.59	43.21	2.19	43.12	53.9	**10.7**	150	0	VBW: 360 Hz,Floor noise
Vert.	2376.170	PK	48.72	28.21	14.29	41.63	2.19	51.78	73.9	22.1	222	38	-
Vert.	2390.000	PK	48.18	28.18	14.30	41.63	2.19	51.22	73.9	22.6	222	38	-
Vert.	4804.000	PK	47.36	31.54	7.07	42.87	2.19	45.29	73.9	28.6	150	0	-
Vert.	7206.000	PK	55.12	37.37	8.39	43.39	2.19	59.68	73.9	14.2	171	5	-
Vert.	9608.000	PK	47.16	38.89	9.59	43.21	2.19	54.62	73.9	19.2	150	0	-
Vert.	4804.000	AV	36.18	31.54	7.07	42.87	2.19	34.11	53.9	19.7	150	0	VBW: 360 Hz,Floor noise
Vert.	9608.000	AV	35.56	38.89	9.59	43.21	2.19	43.02	53.9	10.8	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 (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2375.960	PK	49.52	28.21	14.29	41.63	-24.55	2.19	28.03	53.9	25.8	-
Hori.	2390.000	PK	47.52	28.18	14.30	41.63	-24.55	2.19	26.01	53.9	27.8	*1)
Hori.	7206.000	PK	56.00	37.37	8.39	43.39	-24.55	2.19	36.01	53.9	17.8	-
Vert.	2376.170	PK	48.72	28.21	14.29	41.63	-24.55	2.19	27.23	53.9	26.6	-
Vert.	2390.000	PK	48.18	28.18	14.30	41.63	-24.55	2.19	26.67	53.9	27.2	*1)
Vert.	7206.000	PK	55.12	37.37	8.39	43.39	-24.55	2.19	35.13	53.9	18.7	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

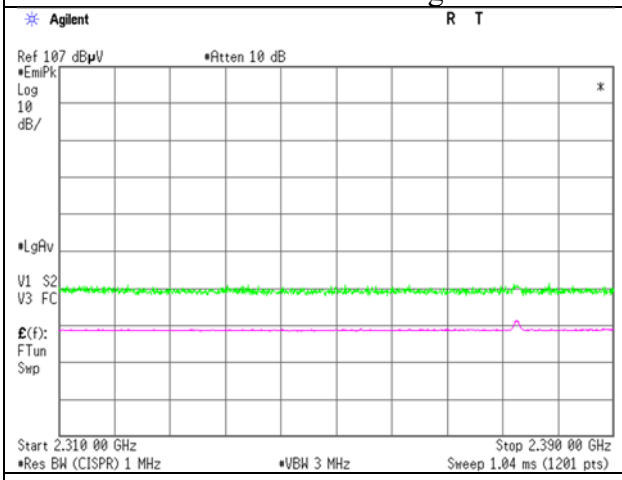
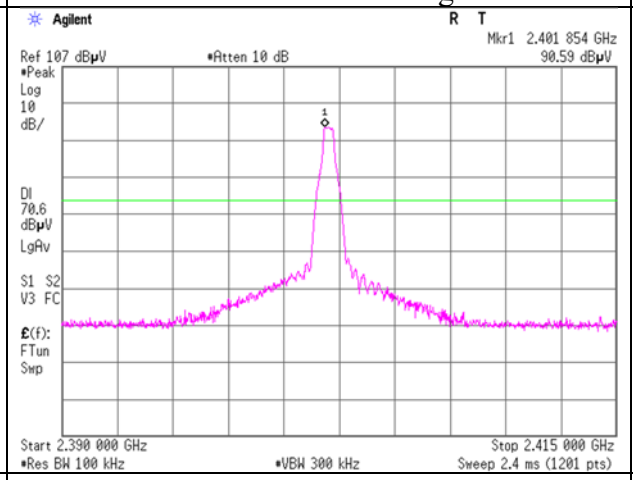
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

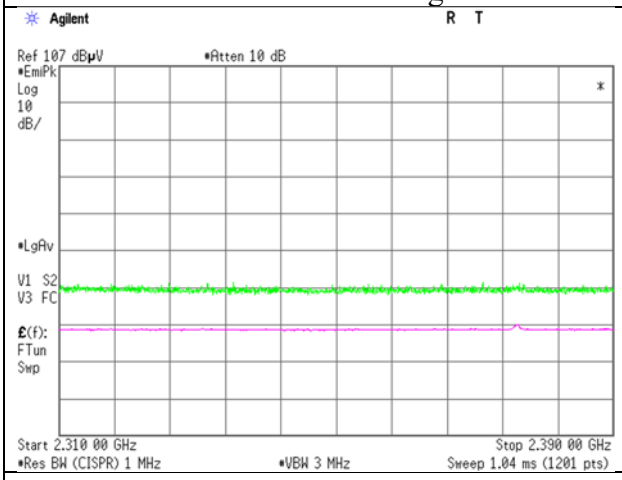
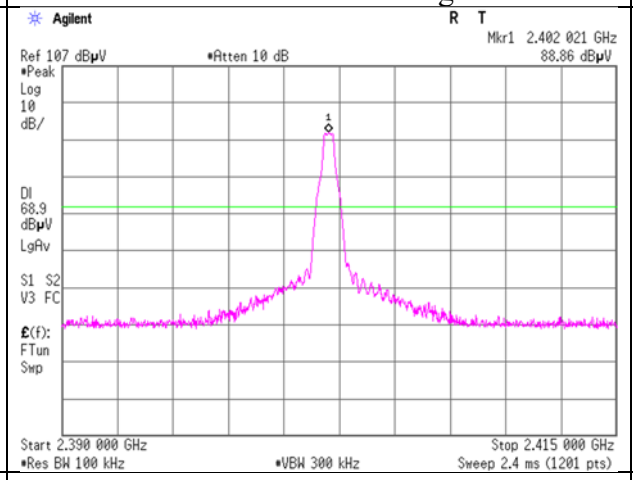
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.53	28.17	14.31	41.64	2.19	93.56	-	-	Carrier
Hori.	2400.000	PK	49.23	28.17	14.31	41.64	2.19	52.26	73.5	21.2	-
Vert.	2402.000	PK	88.80	28.17	14.31	41.64	2.19	91.83	-	-	Carrier
Vert.	2400.000	PK	47.38	28.17	14.31	41.64	2.19	50.41	71.8	21.3	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 19, 2023
Temperature / Humidity	25 deg. C / 32 % RH
Engineer	Hiromasa Sato
	(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	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.3	No.3
Date	February 19, 2023	February 20, 2023
Temperature / Humidity	25 deg. C / 32 % RH	25 deg. C / 30 % RH
Engineer	Hiromasa Sato	Hiromasa Sato
	(1 GHz -10 GHz)	(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	47.10	31.64	7.10	42.83	2.19	45.20	73.9	28.7	150	0	-
Hori.	7323.000	PK	56.66	37.46	8.46	43.52	2.19	61.25	73.9	12.6	240	35	-
Hori.	9764.000	PK	47.02	39.18	9.69	43.02	2.19	55.06	73.9	18.8	150	0	-
Hori.	4882.000	AV	36.50	31.64	7.10	42.83	2.19	34.60	53.9	19.3	150	0	VBW: 360 Hz,Floor noise
Hori.	9764.000	AV	35.90	39.18	9.69	43.02	2.19	43.94	53.9	**9.9**	150	0	VBW: 360 Hz,Floor noise
Vert.	4882.000	PK	47.25	31.64	7.10	42.83	2.19	45.35	73.9	28.5	150	0	-
Vert.	7323.000	PK	58.79	37.46	8.46	43.52	2.19	63.38	73.9	10.5	174	24	-
Vert.	9764.000	PK	47.17	39.18	9.69	43.02	2.19	55.21	73.9	18.6	150	0	-
Vert.	4882.000	AV	36.23	31.64	7.10	42.83	2.19	34.33	53.9	19.5	150	0	VBW: 360 Hz,Floor noise
Vert.	9764.000	AV	35.75	39.18	9.69	43.02	2.19	43.79	53.9	10.1	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 (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	7323.000	PK	56.66	37.46	8.46	43.52	-24.55	2.19	36.70	53.9	17.2	-
Vert.	7323.000	PK	58.79	37.46	8.46	43.52	-24.55	2.19	38.83	53.9	15.0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	February 19, 2023	February 20, 2023
Temperature / Humidity	25 deg. C / 32 % RH	25 deg. C / 30 % RH
Engineer	Hiromasa Sato	Hiromasa Sato
	(1 GHz -10 GHz)	(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	60.21	28.08	14.41	41.68	2.19	63.21	73.9	10.6	122	44	-
Hori.	4960.000	PK	47.57	31.81	7.15	42.80	2.19	45.92	73.9	27.9	150	0	-
Hori.	7440.000	PK	56.37	37.61	8.53	43.65	2.19	61.05	73.9	12.8	200	32	-
Hori.	9920.000	PK	46.96	39.03	9.78	42.82	2.19	55.14	73.9	18.7	150	0	-
Hori.	4960.000	AV	36.55	31.81	7.15	42.80	2.19	34.90	53.9	19.0	150	0	VBW: 360 Hz,Floor noise
Hori.	9920.000	AV	36.00	39.03	9.78	42.82	2.19	44.18	53.9	9.7	150	0	VBW: 360 Hz,Floor noise
Vert.	2483.500	PK	62.30	28.08	14.41	41.68	2.19	65.30	73.9	**8.6**	161	43	-
Vert.	4960.000	PK	47.45	31.81	7.15	42.80	2.19	45.80	73.9	28.1	150	0	-
Vert.	7440.000	PK	55.86	37.61	8.53	43.65	2.19	60.54	73.9	13.3	167	24	-
Vert.	9920.000	PK	47.23	39.03	9.78	42.82	2.19	55.41	73.9	18.4	150	0	-
Vert.	4960.000	AV	36.29	31.81	7.15	42.80	2.19	34.64	53.9	19.2	150	0	VBW: 360 Hz,Floor noise
Vert.	9920.000	AV	35.51	39.03	9.78	42.82	2.19	43.69	53.9	10.2	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 (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	60.21	28.08	14.41	41.68	-24.55	2.19	38.66	53.9	15.2	*1)
Hori.	7440.000	PK	56.37	37.61	8.53	43.65	-24.55	2.19	36.50	53.9	17.4	-
Vert.	2483.500	PK	62.30	28.08	14.41	41.68	-24.55	2.19	40.75	53.9	13.1	*1)
Vert.	7440.000	PK	55.86	37.61	8.53	43.65	-24.55	2.19	35.99	53.9	17.9	-

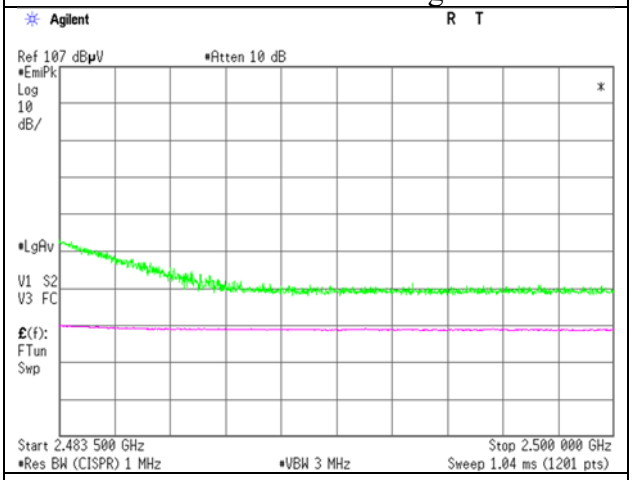
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 19, 2023
Temperature / Humidity	25 deg. C / 32 % RH
Engineer	Hiromasa Sato
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

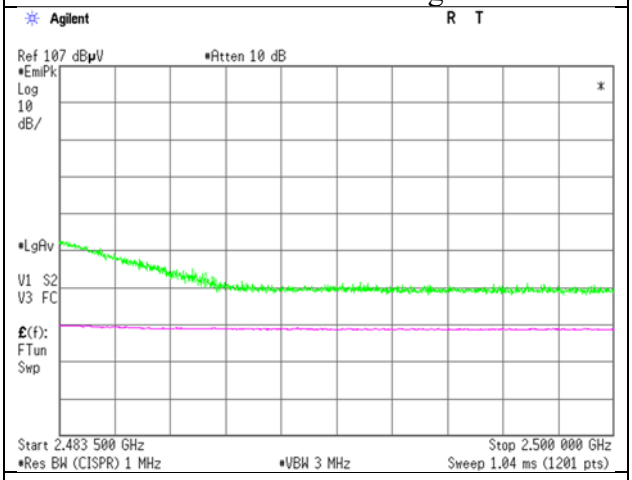
Restricted-band band-edge Plot



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	No.3	No.3
Date	February 19, 2023	February 20, 2023
Temperature / Humidity	25 deg. C / 32 % RH	25 deg. C / 30 % RH
Engineer	Hiromasa Sato	Hiromasa Sato
	(1 GHz -10 GHz)	(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.	2375.970	PK	49.15	28.21	14.29	41.63	2.19	52.21	73.9	21.6	159	54	-
Hori.	2390.000	PK	47.40	28.18	14.30	41.63	2.19	50.44	73.9	23.4	159	54	-
Hori.	4804.000	PK	47.27	31.54	7.07	42.87	2.19	45.20	73.9	28.7	150	0	-
Hori.	7206.000	PK	55.70	37.37	8.39	43.39	2.19	60.26	73.9	13.6	184	31	-
Hori.	9608.000	PK	47.06	38.89	9.59	43.21	2.19	54.52	73.9	19.3	150	0	-
Hori.	4804.000	AV	36.35	31.54	7.07	42.87	2.19	34.28	53.9	19.6	150	0	VBW: 360 Hz,Floor noise
Hori.	9608.000	AV	35.68	38.89	9.59	43.21	2.19	43.14	53.9	10.7	150	0	VBW: 360 Hz,Floor noise
Vert.	2375.830	PK	48.83	28.21	14.29	41.63	2.19	51.89	73.9	22.0	231	32	-
Vert.	2390.000	PK	47.23	28.18	14.30	41.63	2.19	50.27	73.9	23.6	231	32	-
Vert.	4804.000	PK	47.40	31.54	7.07	42.87	2.19	45.33	73.9	28.5	150	0	-
Vert.	7206.000	PK	55.54	37.37	8.39	43.39	2.19	60.10	73.9	13.8	197	27	-
Vert.	9608.000	PK	47.21	38.89	9.59	43.21	2.19	54.67	73.9	19.2	150	0	-
Vert.	4804.000	AV	36.23	31.54	7.07	42.87	2.19	34.16	53.9	19.7	150	0	VBW: 360 Hz,Floor noise
Vert.	9608.000	AV	35.86	38.89	9.59	43.21	2.19	43.32	53.9	**10.5**	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 (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2375.970	PK	49.15	28.21	14.29	41.63	-24.57	2.19	27.64	53.9	26.2	-
Hori.	2390.000	PK	47.40	28.18	14.30	41.63	-24.57	2.19	25.87	53.9	28.0	*1)
Hori.	7206.000	PK	55.70	37.37	8.39	43.39	-24.57	2.19	35.69	53.9	18.2	-
Vert.	2375.830	PK	48.83	28.21	14.29	41.63	-24.57	2.19	27.32	53.9	26.5	-
Vert.	2390.000	PK	47.23	28.18	14.30	41.63	-24.57	2.19	25.70	53.9	28.2	*1)
Vert.	7206.000	PK	55.54	37.37	8.39	43.39	-24.57	2.19	35.53	53.9	18.3	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

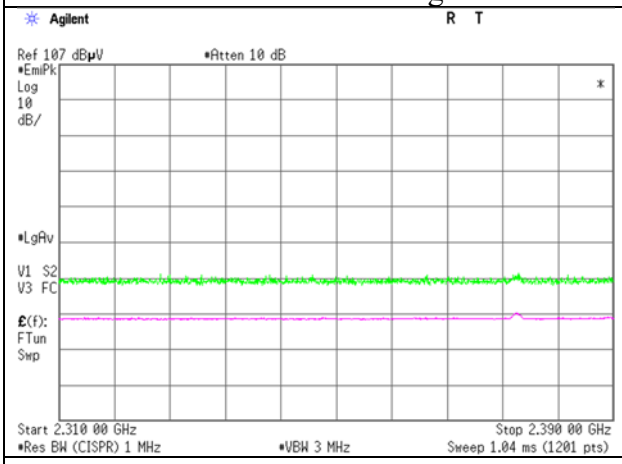
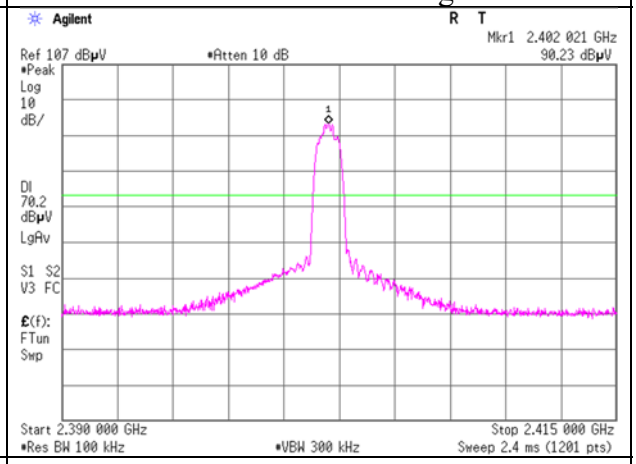
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

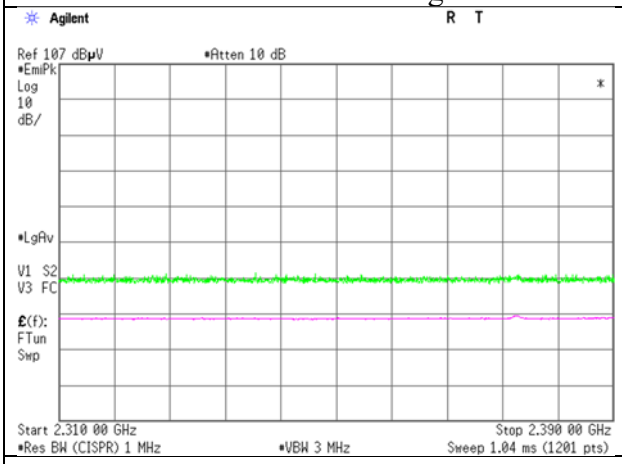
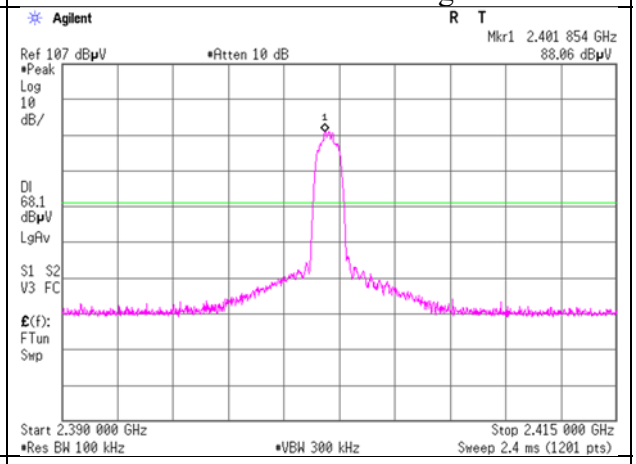
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.15	28.17	14.31	41.64	2.19	93.18	-	-	Carrier
Hori.	2400.000	PK	48.81	28.17	14.31	41.64	2.19	51.84	73.1	21.2	-
Vert.	2402.000	PK	87.98	28.17	14.31	41.64	2.19	91.01	-	-	Carrier
Vert.	2400.000	PK	46.89	28.17	14.31	41.64	2.19	49.92	71.0	21.0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 19, 2023
Temperature / Humidity	25 deg. C / 32 % RH
Engineer	Hiromasa Sato
	(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	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.3	No.3
Date	February 19, 2023	February 20, 2023
Temperature / Humidity	25 deg. C / 32 % RH	25 deg. C / 30 % RH
Engineer	Hiromasa Sato	Hiromasa Sato
	(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.	4882.000	PK	47.16	31.64	7.10	42.83	2.19	45.26	73.9	28.6	150	0	-
Hori.	7323.000	PK	56.79	37.46	8.46	43.52	2.19	61.38	73.9	12.5	212	35	-
Hori.	9764.000	PK	47.08	39.18	9.69	43.02	2.19	55.12	73.9	18.7	150	0	-
Hori.	4882.000	AV	36.27	31.64	7.10	42.83	2.19	34.37	53.9	19.5	150	0	VBW: 360 Hz,Floor noise
Hori.	9764.000	AV	35.81	39.18	9.69	43.02	2.19	43.85	53.9	10.0	150	0	VBW: 360 Hz,Floor noise
Vert.	4882.000	PK	47.45	31.64	7.10	42.83	2.19	45.55	73.9	28.3	150	0	-
Vert.	7323.000	PK	57.87	37.46	8.46	43.52	2.19	62.46	73.9	11.4	204	21	-
Vert.	9764.000	PK	47.26	39.18	9.69	43.02	2.19	55.30	73.9	18.6	150	0	-
Vert.	4882.000	AV	36.22	31.64	7.10	42.83	2.19	34.32	53.9	19.5	150	0	VBW: 360 Hz,Floor noise
Vert.	9764.000	AV	35.93	39.18	9.69	43.02	2.19	43.97	53.9	**9.9**	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 (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	7323.000	PK	56.79	37.46	8.46	43.52	-24.57	2.19	36.81	53.9	17.0	-
Vert.	7323.000	PK	57.87	37.46	8.46	43.52	-24.57	2.19	37.89	53.9	16.0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	February 19, 2023	February 20, 2023
Temperature / Humidity	25 deg. C / 32 % RH	25 deg. C / 30 % RH
Engineer	Hiromasa Sato	Hiromasa Sato
	(1 GHz -10 GHz)	(10 GHz -26.5 GHz , Below 1GHz)
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.	59.253	QP	38.02	8.41	6.59	32.17	0.00	20.85	40.0	19.1	301	119	-
Hori.	108.754	QP	37.72	11.68	7.26	32.14	0.00	24.52	43.5	18.9	301	293	-
Hori.	128.004	QP	35.22	13.73	7.37	32.12	0.00	24.20	43.5	19.3	207	79	-
Hori.	134.334	QP	34.27	14.14	7.48	32.12	0.00	23.77	43.5	19.7	242	3	-
Hori.	198.883	QP	45.51	16.47	7.85	32.07	0.00	37.76	43.5	**5.7**	153	271	-
Hori.	201.695	QP	49.59	11.64	8.03	32.07	0.00	37.19	43.5	6.3	150	278	-
Hori.	294.908	QP	38.11	13.61	8.57	32.00	0.00	28.29	46.0	17.7	100	237	-
Hori.	363.995	QP	36.68	15.13	8.91	31.96	0.00	28.76	46.0	17.2	100	313	-
Hori.	706.294	QP	32.91	19.95	10.32	31.87	0.00	31.31	46.0	14.6	126	37	-
Hori.	960.258	QP	34.77	22.04	11.16	30.62	0.00	37.35	53.9	16.5	100	212	-
Hori.	2483.500	PK	59.47	28.08	14.41	41.68	2.19	62.47	73.9	11.4	219	42	-
Hori.	4960.000	PK	47.52	31.81	7.15	42.80	2.19	45.87	73.9	28.0	150	0	-
Hori.	7440.000	PK	55.54	37.61	8.53	43.65	2.19	60.22	73.9	13.6	230	31	-
Hori.	9920.000	PK	47.05	39.03	9.78	42.82	2.19	55.23	73.9	18.6	150	0	-
Hori.	4960.000	AV	36.55	31.81	7.15	42.80	2.19	34.90	53.9	19.0	150	0	VBW: 360 Hz,Floor noise
Hori.	9920.000	AV	35.74	39.03	9.78	42.82	2.19	43.92	53.9	9.9	150	0	VBW: 360 Hz,Floor noise
Vert.	59.222	QP	35.33	8.42	6.59	32.17	0.00	18.17	40.0	21.8	100	360	-
Vert.	107.920	QP	36.25	11.57	7.27	32.14	0.00	22.95	43.5	20.5	100	254	-
Vert.	120.557	QP	36.22	13.16	7.26	32.13	0.00	24.51	43.5	18.9	100	98	-
Vert.	133.303	QP	36.67	14.07	7.47	32.12	0.00	26.09	43.5	17.4	100	228	-
Vert.	194.467	QP	41.24	16.43	7.83	32.07	0.00	33.43	43.5	10.0	142	320	-
Vert.	200.553	QP	47.57	11.68	8.02	32.07	0.00	35.20	43.5	8.3	143	335	-
Vert.	599.990	QP	32.91	19.33	9.90	31.94	0.00	30.20	46.0	15.8	100	170	-
Vert.	706.294	QP	31.33	19.95	10.32	31.87	0.00	29.73	46.0	16.2	100	315	-
Vert.	960.258	QP	30.60	22.04	11.16	30.62	0.00	33.18	53.9	20.7	100	189	-
Vert.	2483.500	PK	60.39	28.08	14.41	41.68	2.19	63.39	73.9	10.5	158	44	-
Vert.	4960.000	PK	47.22	31.81	7.15	42.80	2.19	45.57	73.9	28.3	150	0	-
Vert.	7440.000	PK	56.33	37.61	8.53	43.65	2.19	61.01	73.9	12.8	167	24	-
Vert.	9920.000	PK	46.86	39.03	9.78	42.82	2.19	55.04	73.9	18.8	150	0	-
Vert.	4960.000	AV	36.10	31.81	7.15	42.80	2.19	34.45	53.9	19.4	150	0	VBW: 360 Hz,Floor noise
Vert.	9920.000	AV	35.69	39.03	9.78	42.82	2.19	43.87	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 (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	59.47	28.08	14.41	41.68	-24.57	2.19	37.90	53.9	16.0	*1)
Hori.	7440.000	PK	55.54	37.61	8.53	43.65	-24.57	2.19	35.65	53.9	18.2	-
Vert.	2483.500	PK	60.39	28.08	14.41	41.68	-24.57	2.19	38.82	53.9	15.0	*1)
Vert.	7440.000	PK	56.33	37.61	8.53	43.65	-24.57	2.19	36.44	53.9	17.4	-

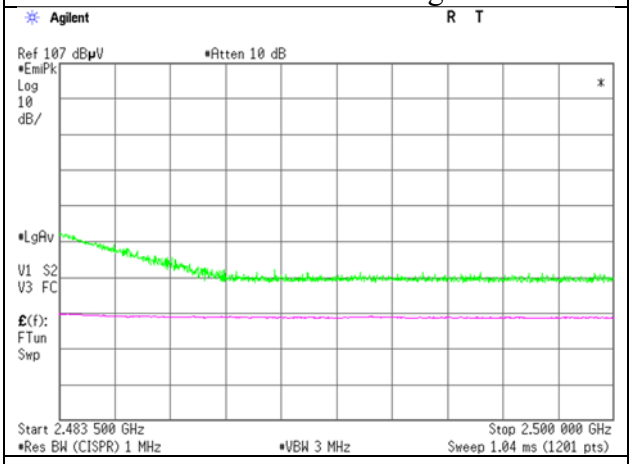
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 19, 2023
Temperature / Humidity	25 deg. C / 32 % RH
Engineer	Hiromasa Sato
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz

Horizontal

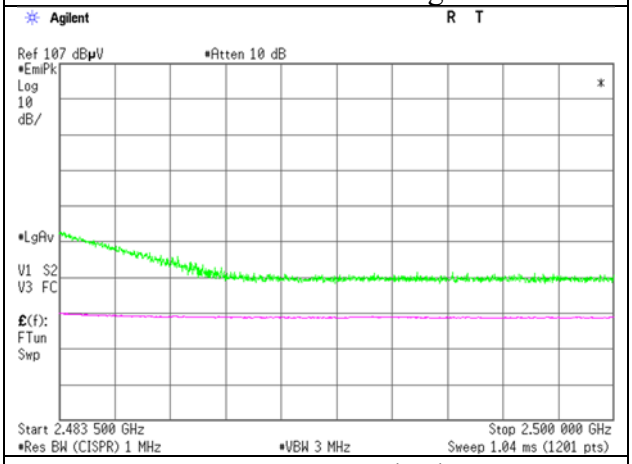
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

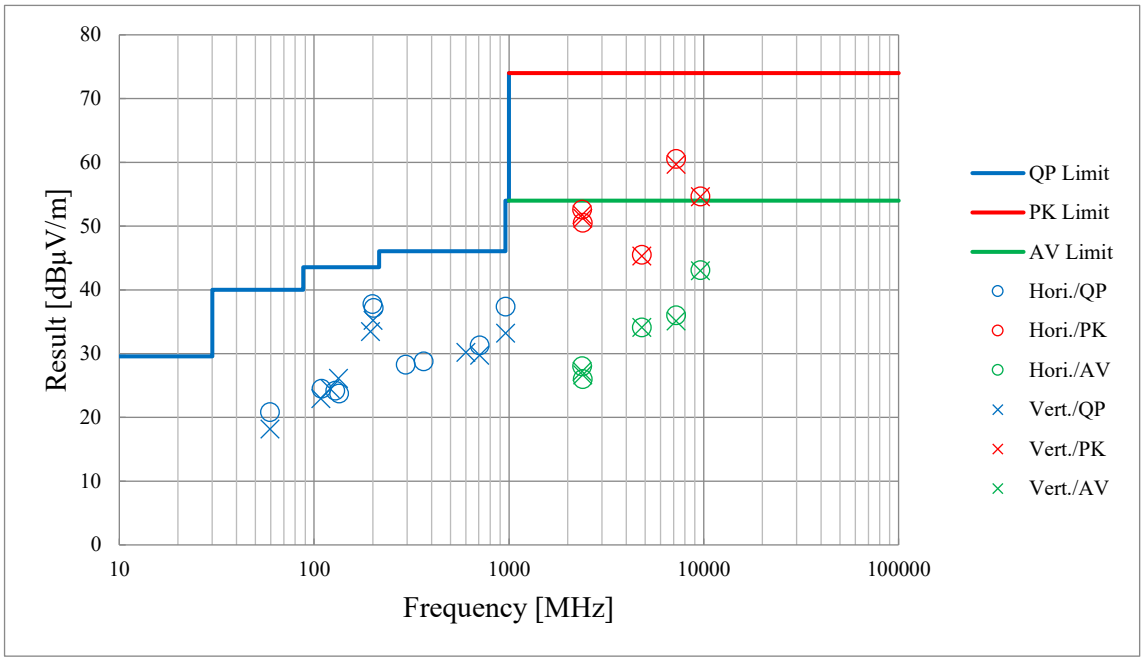


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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	No.3	No.3
Date	February 19, 2023	February 20, 2023
Temperature / Humidity	25 deg. C / 32 % RH	25 deg. C / 30 % RH
Engineer	Hiromasa Sato	Hiromasa Sato
	(1 GHz -10 GHz)	(10 GHz -26.5 GHz , Below 1GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz	



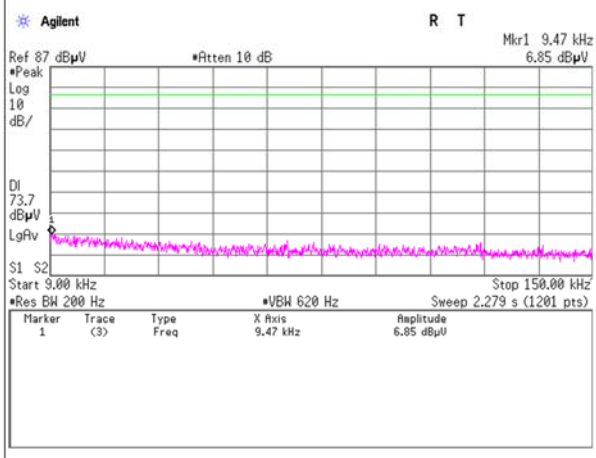
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

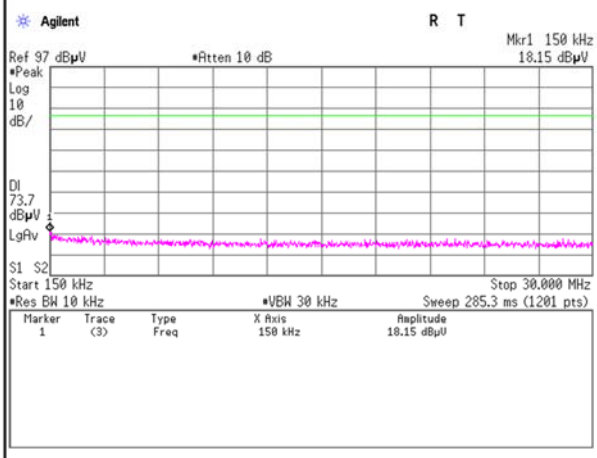
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off, DH5

2402 MHz

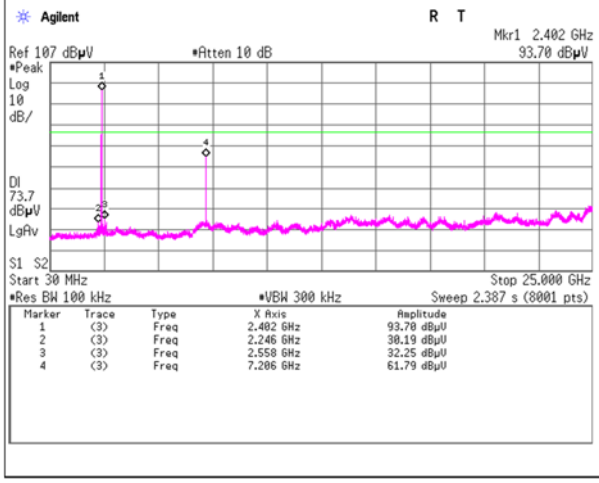
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

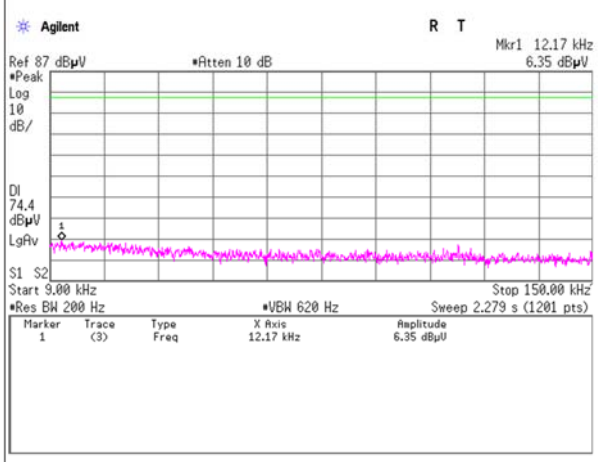


Conducted Spurious Emission

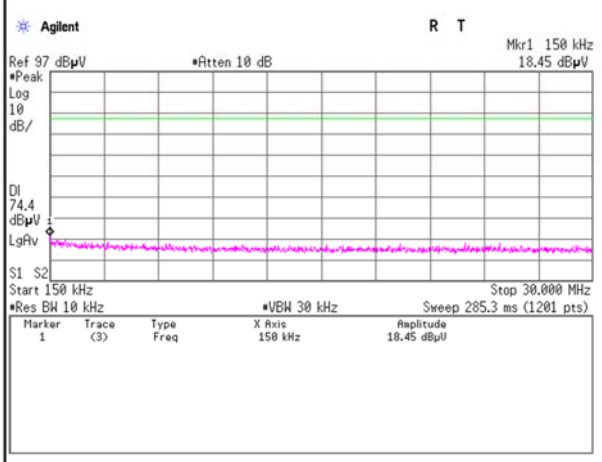
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off, DH5

2441 MHz

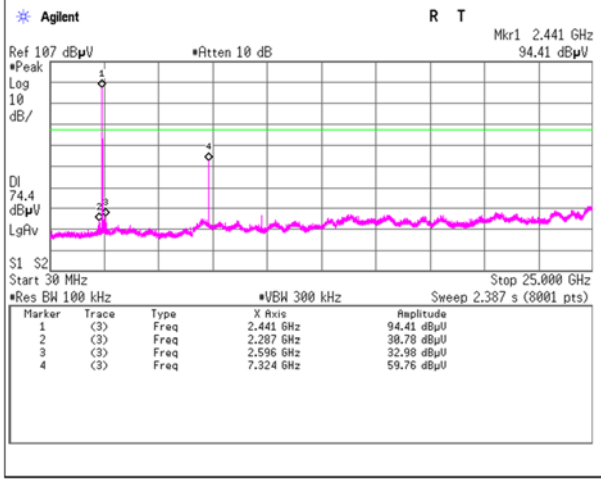
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

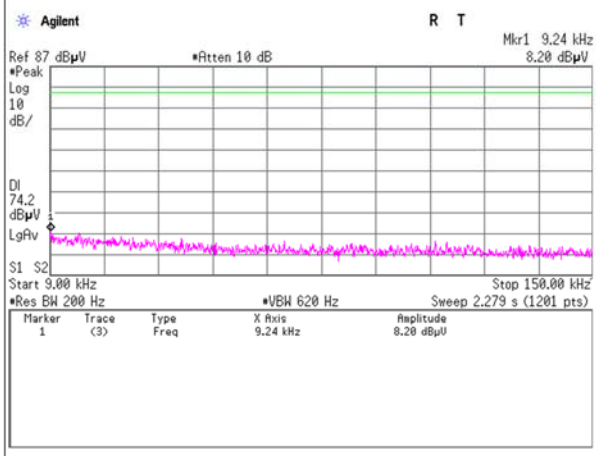


Conducted Spurious Emission

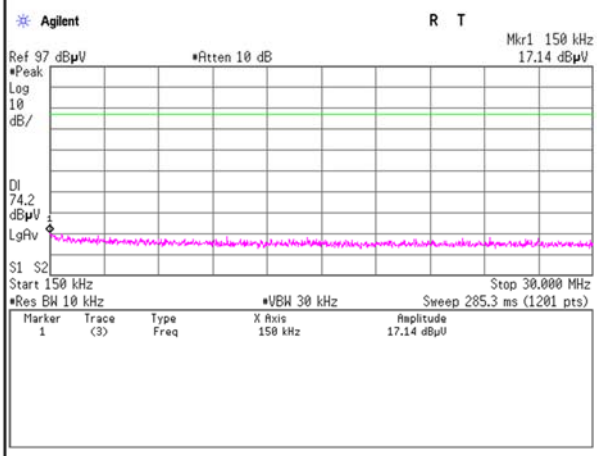
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off, DH5

2480 MHz

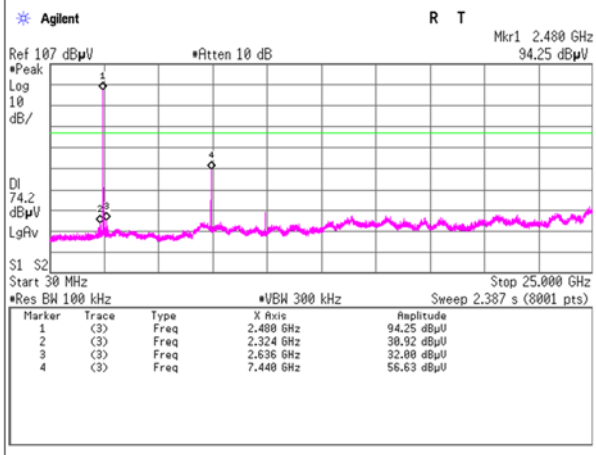
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

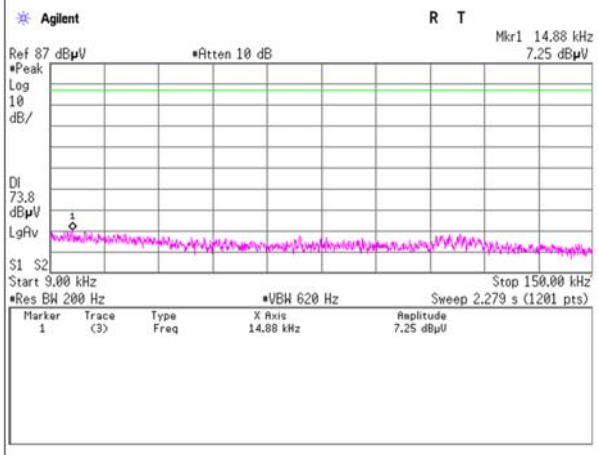


Conducted Spurious Emission

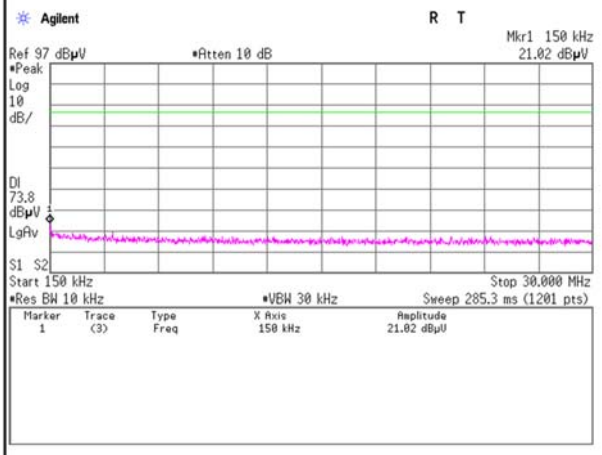
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off, 3DH5

2402 MHz

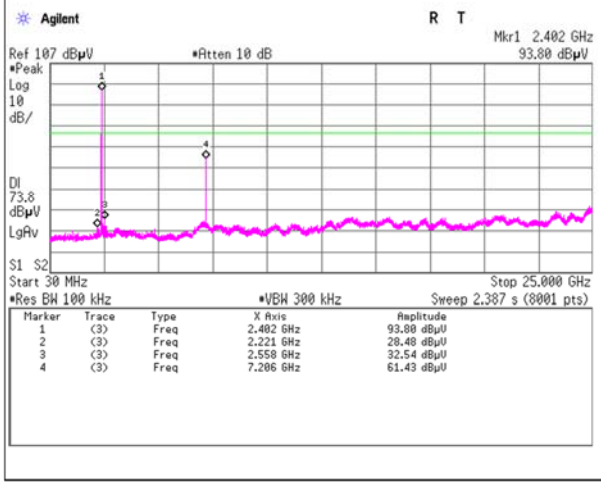
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

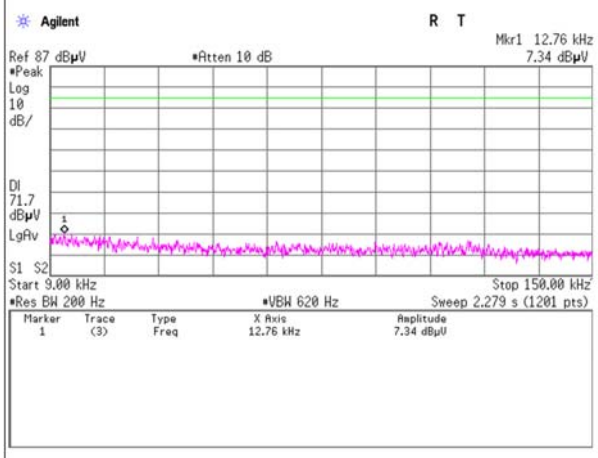


Conducted Spurious Emission

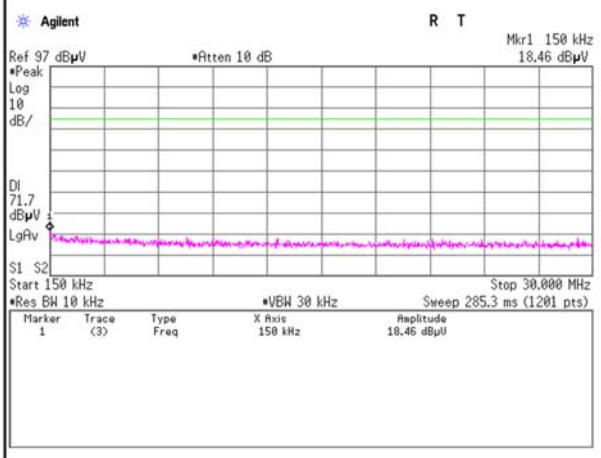
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off, 3DH5

2441 MHz

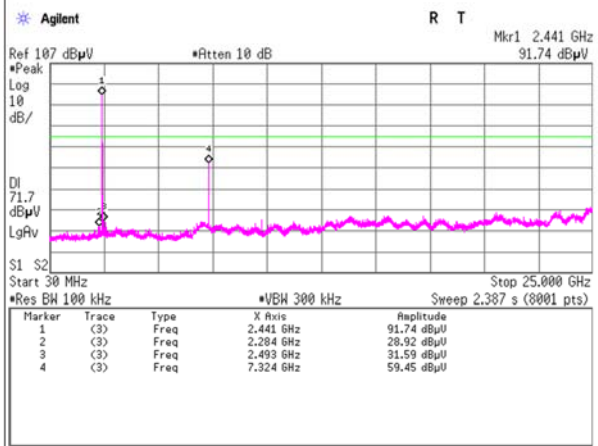
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

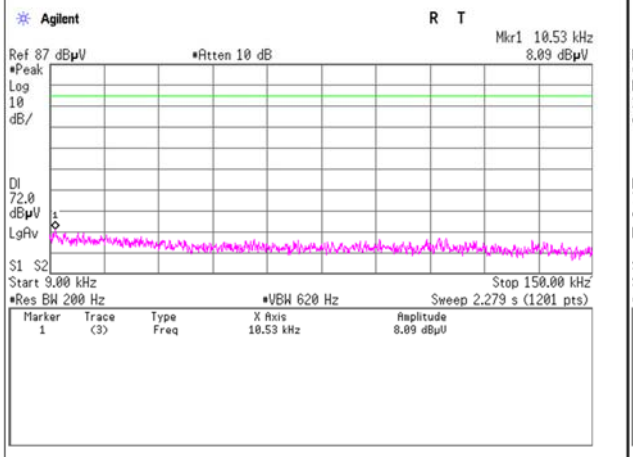


Conducted Spurious Emission

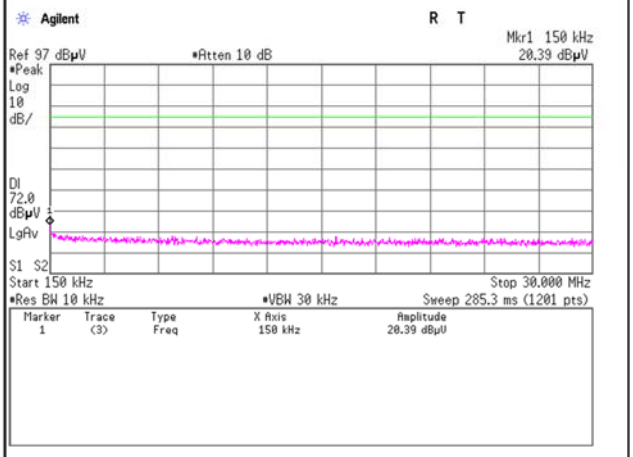
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx, Hopping Off, 3DH5

2480 MHz

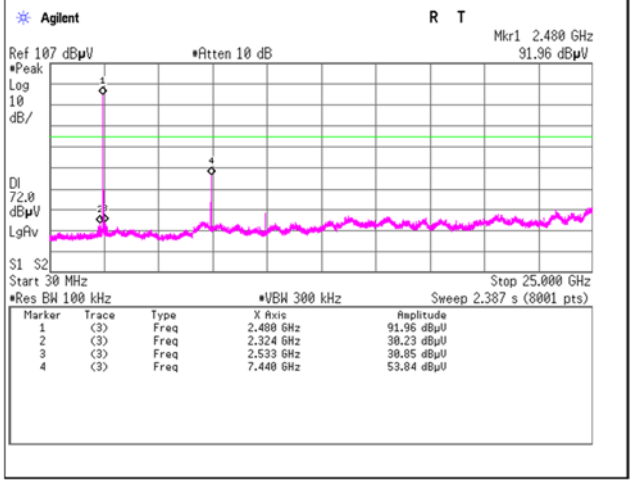
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

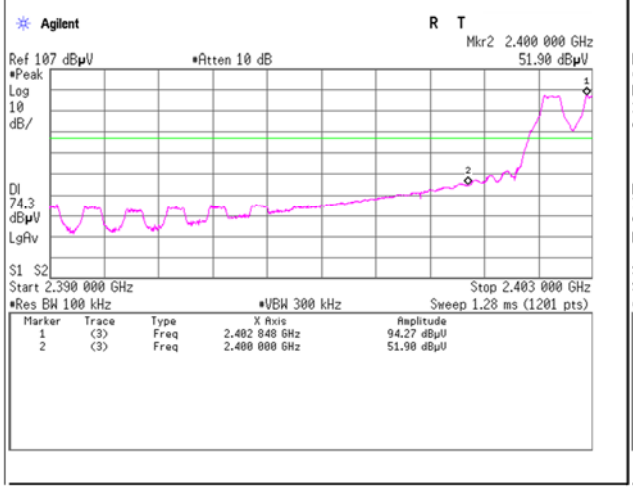


Conducted Emission Band Edge compliance

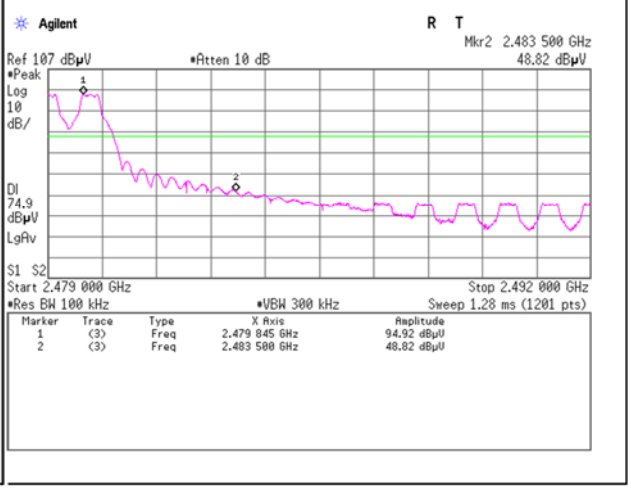
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx DH5

Hopping On

Low

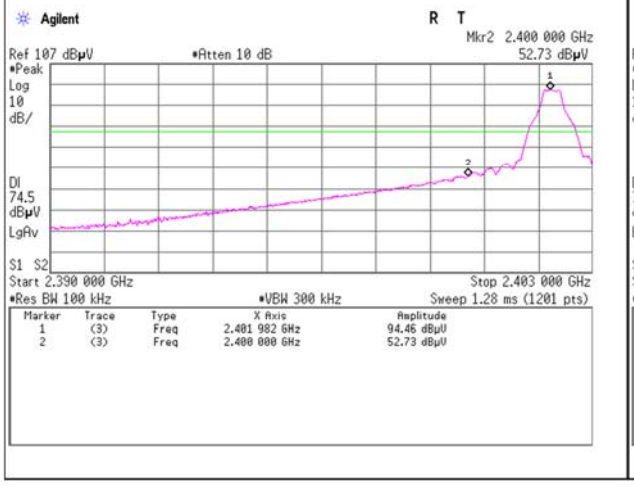


High

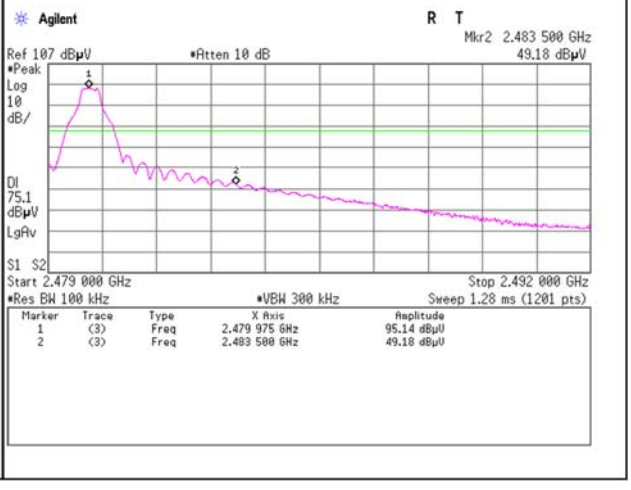


Hopping Off

Low



High

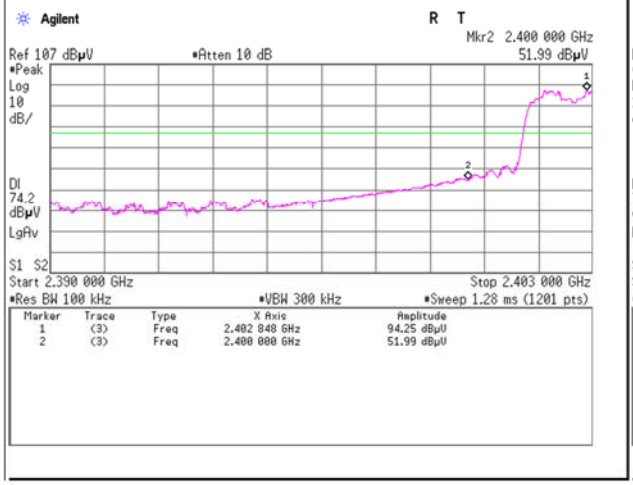


Conducted Emission Band Edge compliance

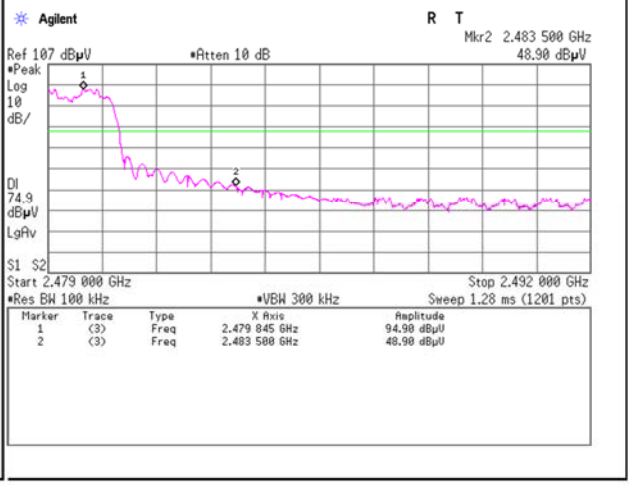
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	February 16, 2023
Temperature / Humidity	21 deg. C / 45 % RH
Engineer	Hiromasa Sato
Mode	Tx 3DH5

Hopping On

Low

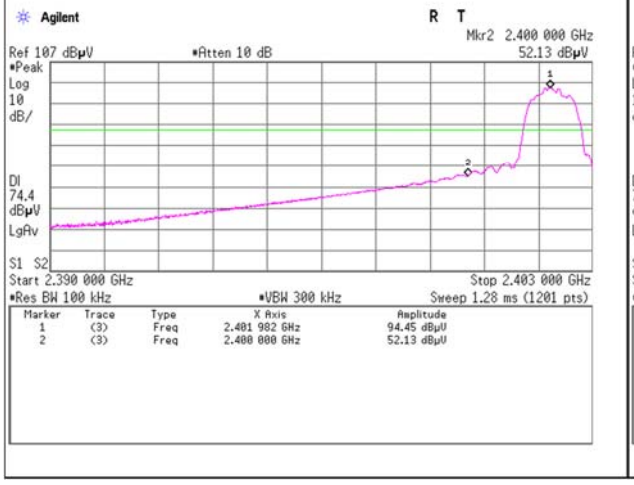


High

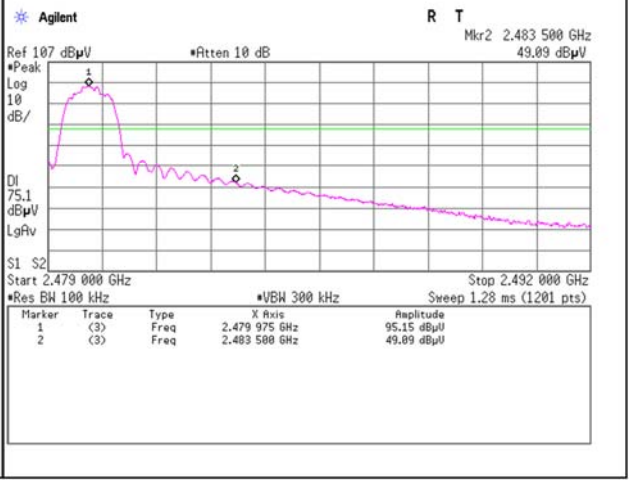


Hopping Off

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-07	145111	Digital Tester	SANWA	PC500	7019232	2022/09/20	12
AT	SAT10-16	160494	Attenuator	Weinschel Corp.	54A-10	83420	2022/12/01	12
AT	SCC-G63	196946	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803411/2	2023/03/02	12
AT	SOS-19	175823	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/06	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,RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2022/11/01	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2022/04/15	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2022/05/18	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2023/02/09	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2023/02/02	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2023/03/03	12
RE	SAT10-05	145136	Attenuator	Keysight Technologies Inc	8493C-010	74864	2022/10/20	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2023/02/09	12
RE	SBA-03	145023	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032666	2022/05/14	12

Test Equipment(2/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2022/04/20	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2023/03/03	12
RE	SCC-G43	156380	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	SN MY 13406/4E	2022/05/20	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2023/03/03	12
RE	SCC-G58	183047	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800287/4A	-	-
RE	SCC-G70	200010	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575618/4	2022/07/22	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2022/10/20	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-739	2022/03/16	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2022/06/06	12
RE	SHA-10	194685	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	711	2022/03/16	12
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	196	2022/05/14	12
RE	SOS-23	191840	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
RE	STR-09	213530	Test Receiver	Rohde & Schwarz	ESW44	103068	2023/01/12	12
RE	STS-03	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2022/09/20	12

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

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

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

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