RADIO TEST REPORT

Test Report No. 14033198S-A-R1

Customer	**Panasonic Automotive Systems Co., Ltd.**
Description of EUT	**Car Navigation**
Model Number of EUT	**AT2107**
FCC ID	**ACJ932AT2107**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**January 18, 2024**
Remarks	**Bluetooth (BR / EDR) parts**

Representative Test Engineer	Approved By
Shiro Kobayashi 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# 20.0

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REVISION HISTORY

Original Test Report No.: 14033198S-A

This report is a revised version of 14033198S-A. 14033198S-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14033198S-A	April 22, 2022	-
1	14033198S-A-R1	January 18, 2024	Cover page Addition of FCC ID Update of Regulation (Deletion of “2022”)
			SECTION 1 Customer Information Addition of ‘*1) The Grantee name in the FCC application is “Panasonic Corporation of North America”.’
			3.1 Test Specification Revised from “FCC Part 15 final revised on April 1, 2022 and effective May 2, 2022” to “The latest version on the first day of the testing period”. Deleted “* The revision does not affect the test result conducted before its effective date.”

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, Kanagawa-ken 224-8520, Japan
Telephone Number	+81-70-1552-3093
Contact Person	Kouji Uchino

*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 Navigation
Model Number	AT2107
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	October 4, 2021
Test Date	October 7 to 25, 2021

2.2 Product Description

General Specification

Rating	DC 13.2 V

Radio Specification

Bluetooth (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BT: FHSS (GFSK, π/4 DQPSK, 8 DPSK) BT LE: GFSK
Antenna Type	Inverted F type Antenna
Antenna Gain	2.08 dBi

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
Antenna Type	Inverted F type Antenna
Antenna Gain	4.04 dBi

*1) This test report applies to Bluetooth (BR/EDR) part.

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)			
20 dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)		Complied a)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Dwell time	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied c)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(b)(1)		Complied d)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	8.0 dB 626.237 MHz, QP, Vert. Tx 3DH5 2402 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)

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 RF Part 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.

Shonan EMC Lab.

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-30 MHz	2.9 dB	2.9 dB	3.0 dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.1 dB	3.1 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.1 dB	6.1 dB	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-
	6 GHz-18 GHz	5.2 dB	5.3 dB	5.3 dB	-
	18 GHz-40 GHz	5.4 dB	5.5 dB	5.5 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-
	18 GHz-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 1GHz	0.93 dB
Conducted emissions and Power Density Measurement 1 GHz-3 GHz	0.92 dB
Conducted emissions and Power Density Measurement 3 GHz-18 GHz	2.3 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-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, Facsimile: +81 463 50 6401
A2LA Certificate Number: 1266.03
(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	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: BR: Fixed
EDR: Fixed

Software: Labtool Version: 2.0.0.71
(Date: 2021.08.19, 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.

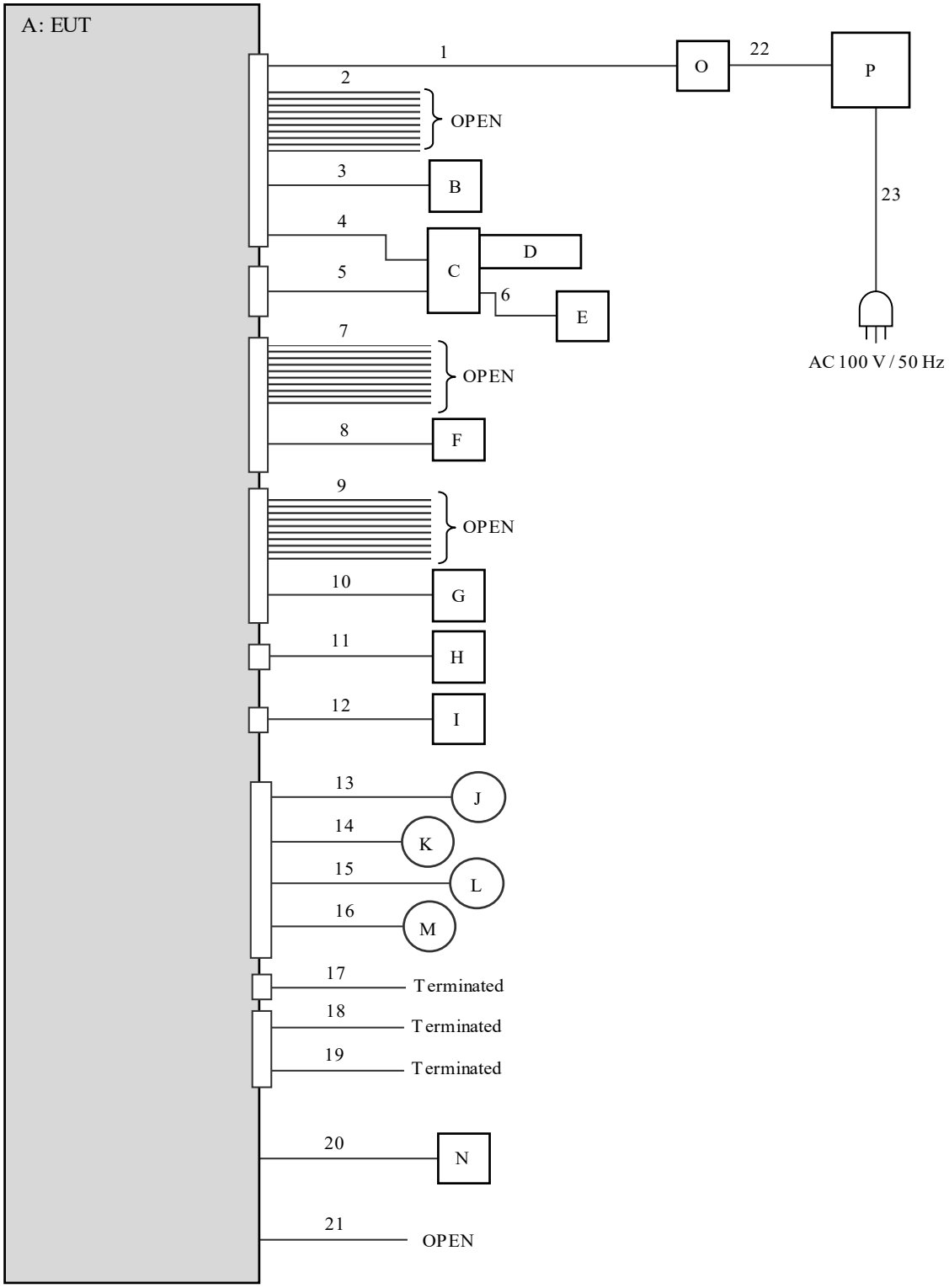
Details of Operating Mode(s)

Test Item	Mode	Hopping	Tested Frequency
Conducted Spurious Emission, Radiated 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 (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
* It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.

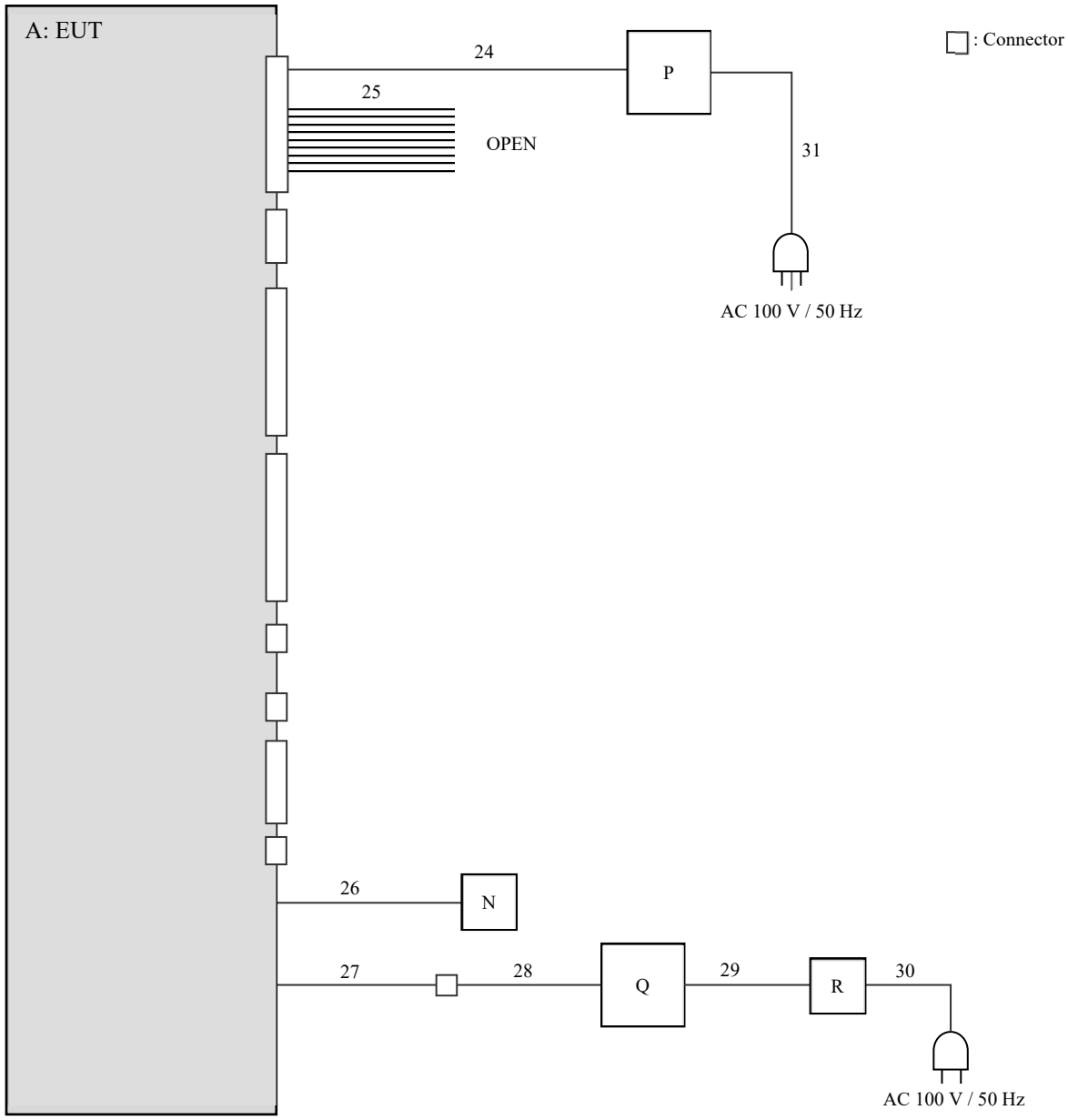
4.2 Configuration and Peripherals

< Radiated Emission test >



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

< Antenna Terminal Conducted test >



Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Navigation	AT2107	No.2 *1) N0.1 *2)	Panasonic Automotive Systems Co., Ltd.	EUT
B	Steering Switch	ST-SW-IF	0011	Panasonic Automotive Systems Co., Ltd.	-
C	IF-Box	DEP32-10078	033	Panasonic Automotive Systems Co., Ltd.	-
D	USB Memory	USM4GU	-	Sony Corporation	-
E	Mobile Phone	SO-01F	CB5125QLDK	Sony Corporation	-
F	MIC	GP-SDA3510A	0DC062519	Panasonic Automotive Systems Co., Ltd.	-
G	MIC	GP-SDA3510A	0DC062856	Panasonic Automotive Systems Co., Ltd.	-
H	Rear Camera	GP-KDM301RC	92	Panasonic Automotive Systems Co., Ltd.	-
I	GPS Antenna	ANN-MS	-	U-Blox	-
J	Speaker	KFC-RS160	-	KENWOOD	-
K	Speaker	KFC-RS160	-	KENWOOD	-
L	Speaker	KFC-RS160	-	KENWOOD	-
M	Speaker	KFC-RS160	-	KENWOOD	-
N	Jig board	RCarDBG_JTAG2	WR14-4333 *1) WR20-4923 *2)	WESTEK	-
O	Terminal Block	-	-	-	-
P	Power Supply (DC)	PAN35-10A	BP002287	KIKUSUI	-
Q	Laptop Computer	7666-77J	LV-B8R1X 08/05	Lenovo	-
R	AC Adapter	42T4422	11S92P1154Z1DXF 1DBFDN	Lenovo	-

*1) For Antenna Terminal test
*2) For Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	2.5 + 0.2	Unshielded	Unshielded	-
2	Signal	2.5	Unshielded	Unshielded	-
3	Signal	2.5 + 0.1	Unshielded	Unshielded	-
4	IF Box Power	2.5 + 0.3	Unshielded	Unshielded	-
5	Signal	2.5	Shielded	Shielded	-
6	USB type C	0.9	Shielded	Shielded	-
7	Signal	2.5	Unshielded	Unshielded	-
8	MIC	2.5 + 0.5	Unshielded	Unshielded	-
9	Signal	2.5	Unshielded	Unshielded	-
10	MIC	2.5 + 0.5	Unshielded	Unshielded	-
11	Rear Camera	3.0 + 0.15	Unshielded	Unshielded	-
12	GPS	3.0 + 0.12	Shielded	Shielded	-
13	Speaker	1.0 + 1.9	Unshielded	Unshielded	-
14	Speaker	1.0 + 1.9	Unshielded	Unshielded	-
15	Speaker	1.0 + 1.9	Unshielded	Unshielded	-
16	Speaker	1.0 + 1.9	Unshielded	Unshielded	-
17	DCM	3.0	Shielded	Shielded	-
18	FM	2.5	Shielded	Shielded	-
19	FM	2.5	Shielded	Shielded	-
20	Signal	0.1	Unshielded	Unshielded	*3)
21	UART	0.3	Unshielded	Unshielded	*3)
22	DC	2.4	Unshielded	Unshielded	-
23	AC	2.0	Unshielded	Unshielded	-
24	DC	3.0	Unshielded	Unshielded	-
25	Signal	3.0	Unshielded	Unshielded	-
26	Signal	0.1	Unshielded	Unshielded	*3)
27	UART	0.3	Unshielded	Unshielded	*3)
28	UART-USB	1.5	Shielded	Shielded	-
29	DC	1.8	Unshielded	Unshielded	-
30	AC	0.9	Unshielded	Unshielded	-
31	AC	2.0	Unshielded	Unshielded	-

*3) This cable is for testing and is not included with products.

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.

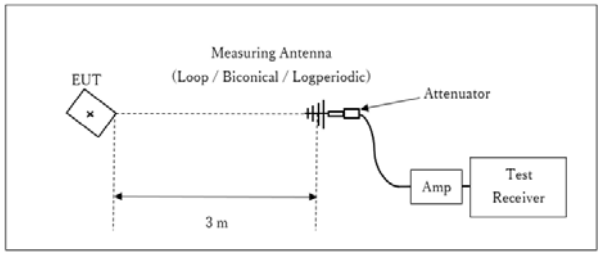
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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: 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

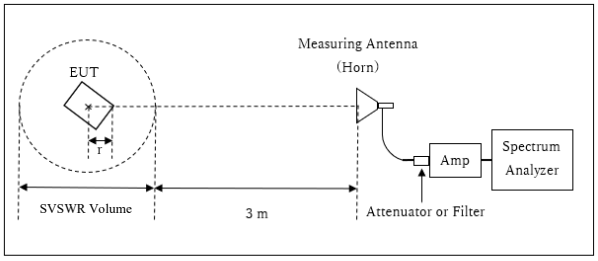
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

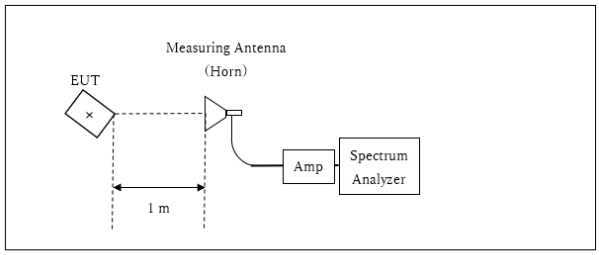


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.80 m / 3.0 m) = 2.06 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.80 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.20 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 (12 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	100 kHz	300 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	Enough width to display emission skirts and neighborhood restricted band	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. 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

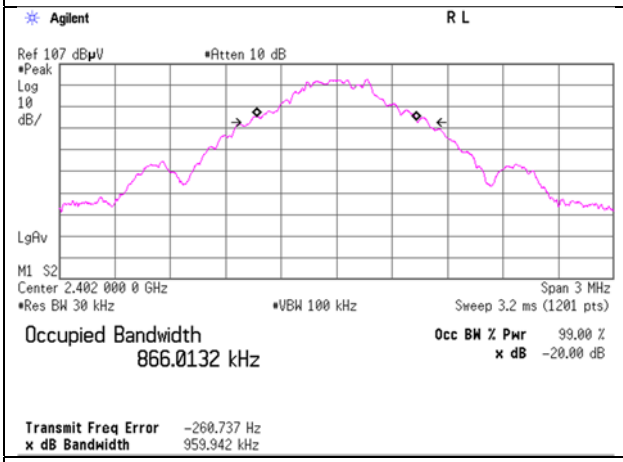
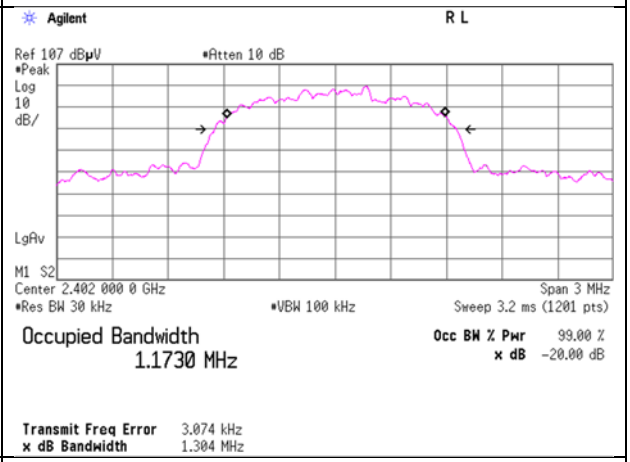
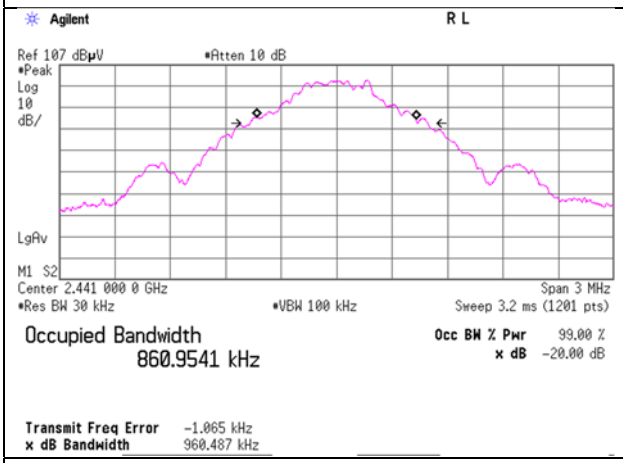
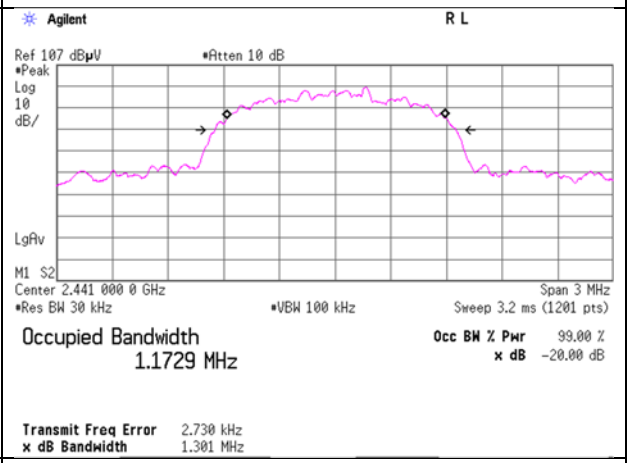
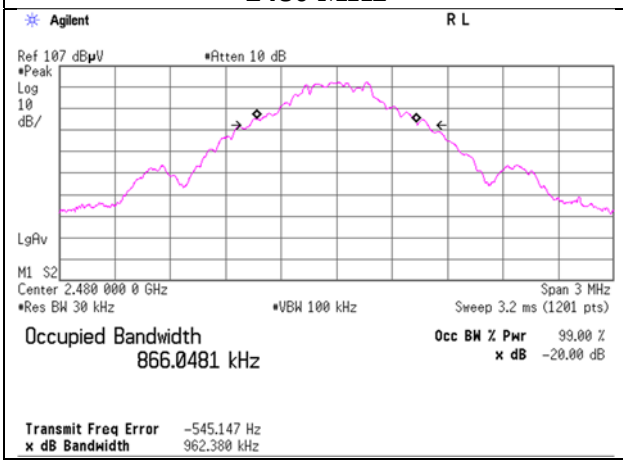
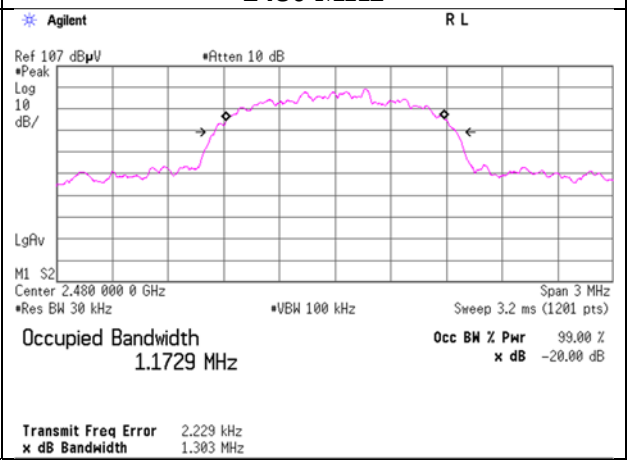
20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation

Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, Tx, Hopping On

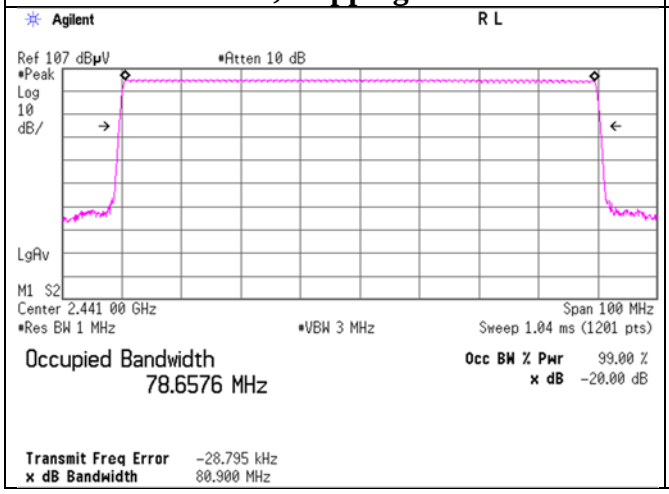
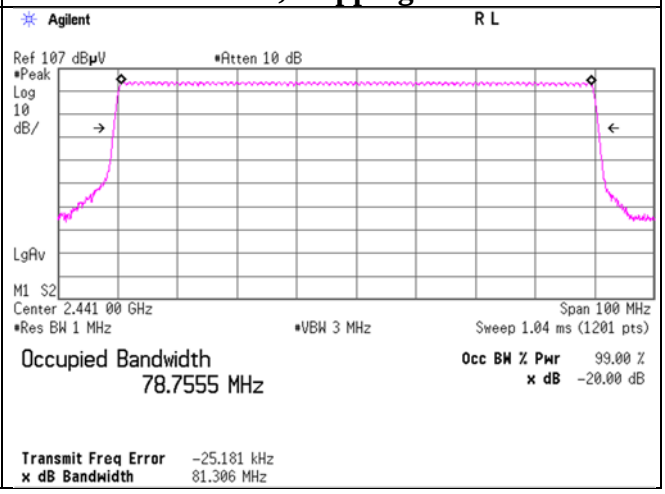
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.960	866.013	1.000	>= 0.640
DH5	2441.0	0.960	860.954	1.000	>= 0.640
DH5	2480.0	0.962	866.048	1.000	>= 0.642
DH5	Hopping On	-	78657.600	-	-
3DH5	2402.0	1.304	1173.000	1.000	>= 0.869
3DH5	2441.0	1.301	1172.900	1.000	>= 0.867
3DH5	2480.0	1.303	1172.900	1.000	>= 0.869
3DH5	Hopping On	-	78755.500	-	-

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

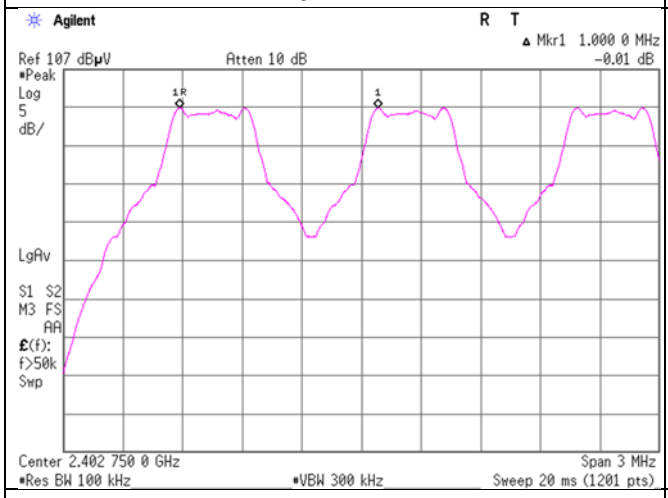
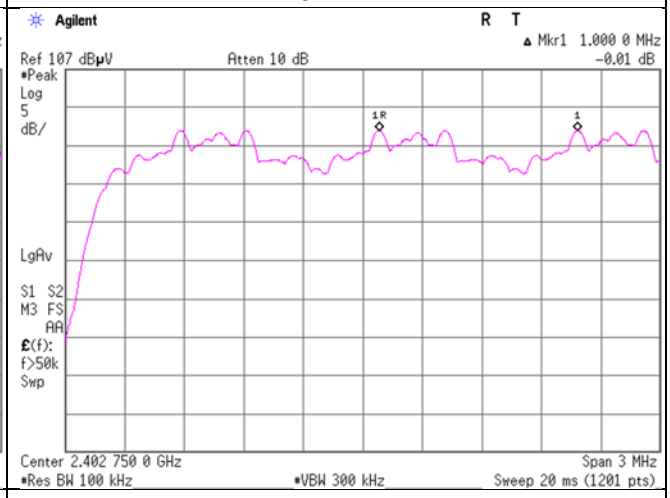
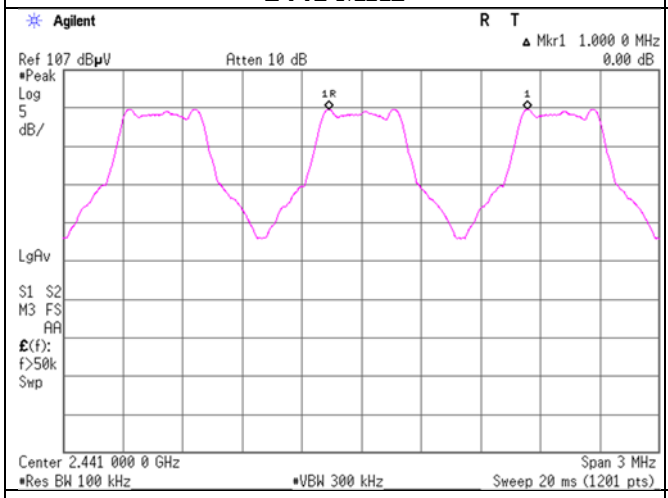
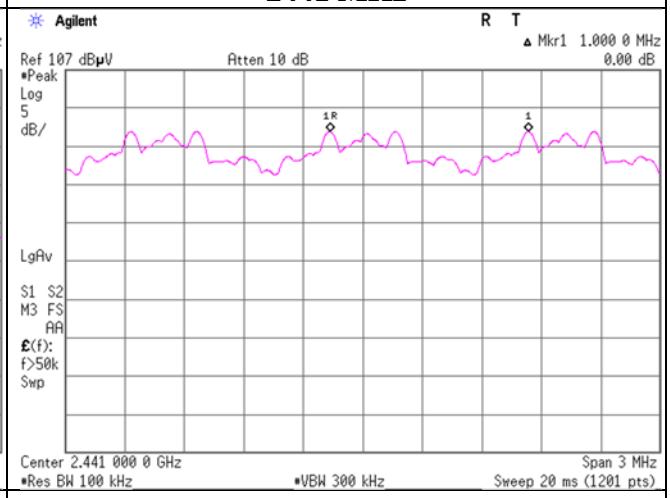
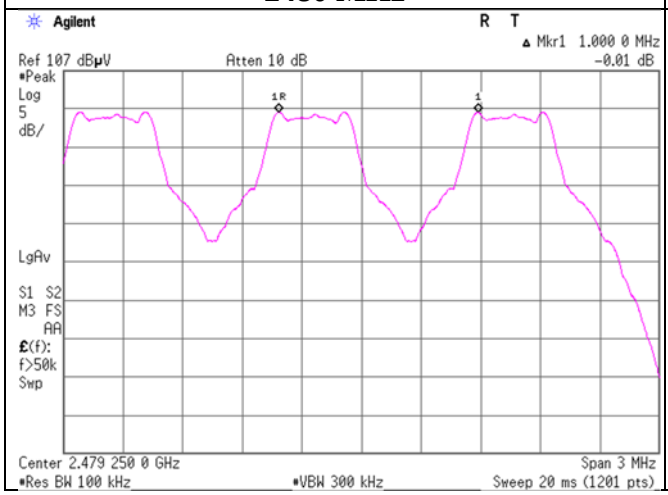
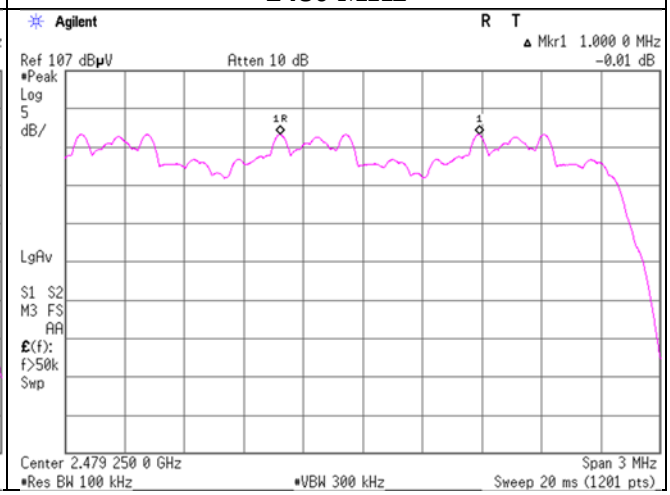
20 dB Bandwidth and 99 % Occupied Bandwidth

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

20 dB Bandwidth and 99 % Occupied Bandwidth

DH5, Hopping On	3DH5, Hopping On
	

Carrier Frequency Separation

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

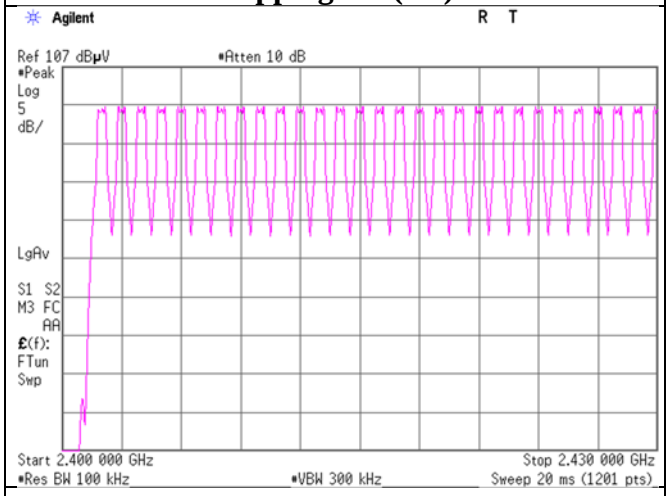
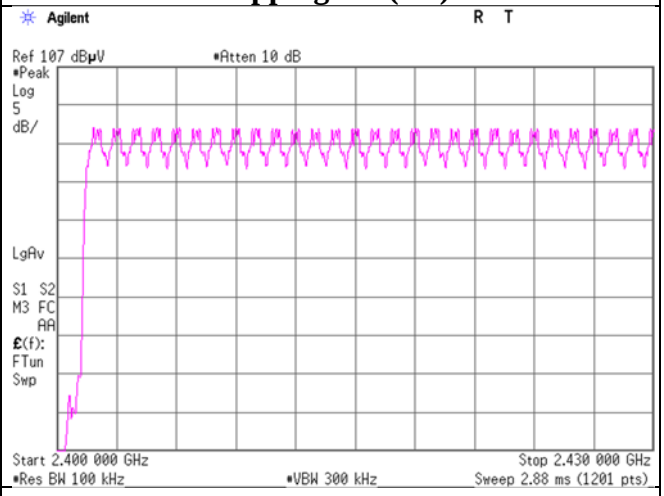
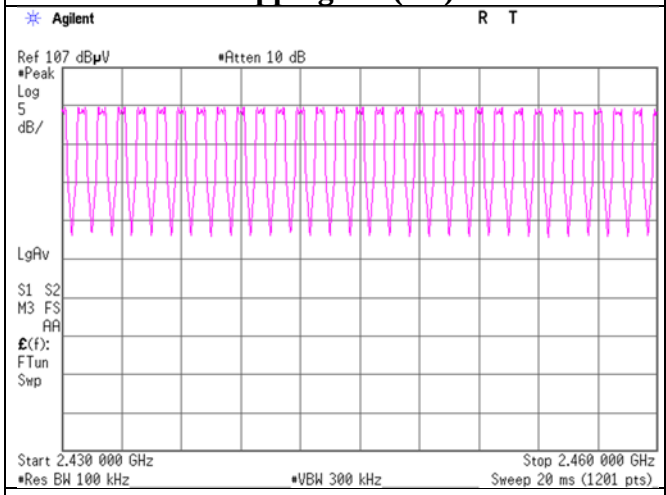
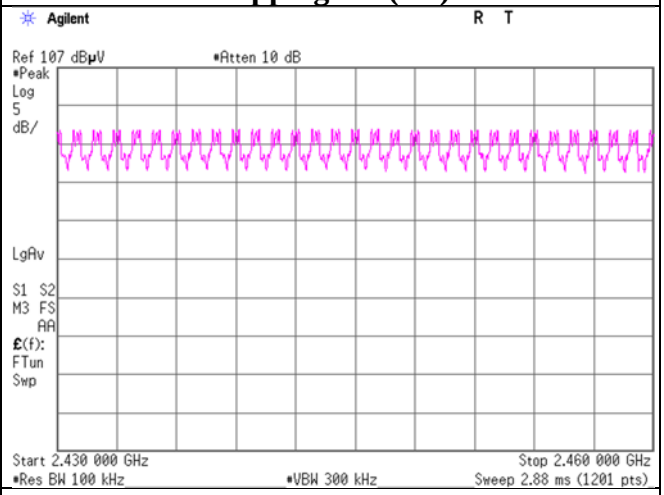
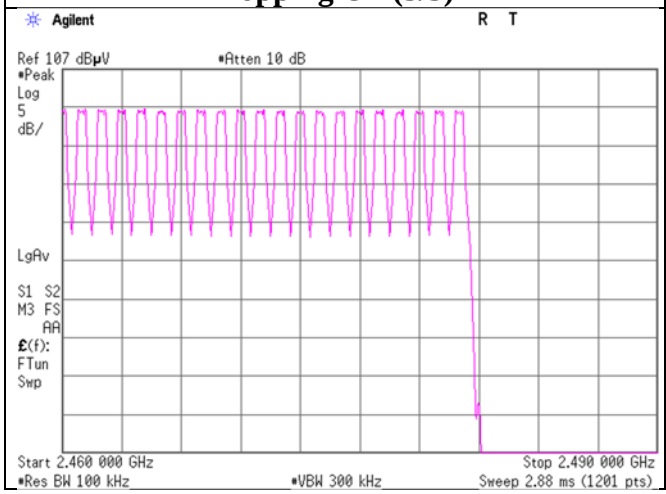
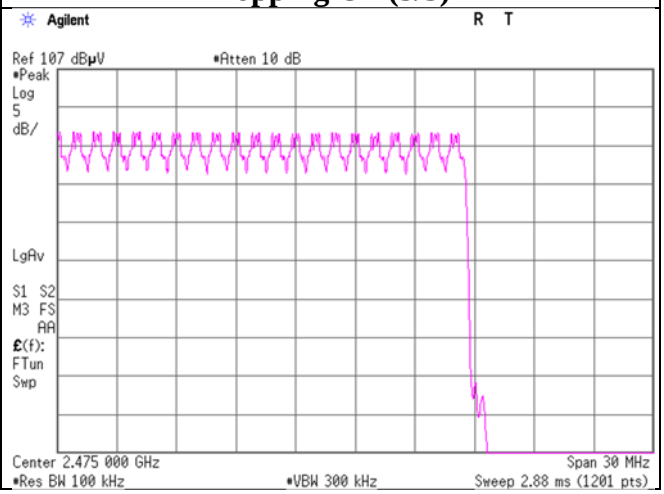
Number of Hopping Frequency

Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
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

Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	49.6 times / 5 sec. x 31.6 sec. = 314 times	0.393	123	400
DH3	27.4 times / 5 sec. x 31.6 sec. = 174 times	1.648	287	400
DH5	21.4 times / 5 sec. x 31.6 sec. = 136 times	2.897	394	400
3DH1	49.0 times / 5 sec. x 31.6 sec. = 310 times	0.392	121	400
3DH3	28.8 times / 5 sec. x 31.6 sec. = 183 times	1.644	301	400
3DH5	21.2 times / 5 sec. x 31.6 sec. = 134 times	2.894	388	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

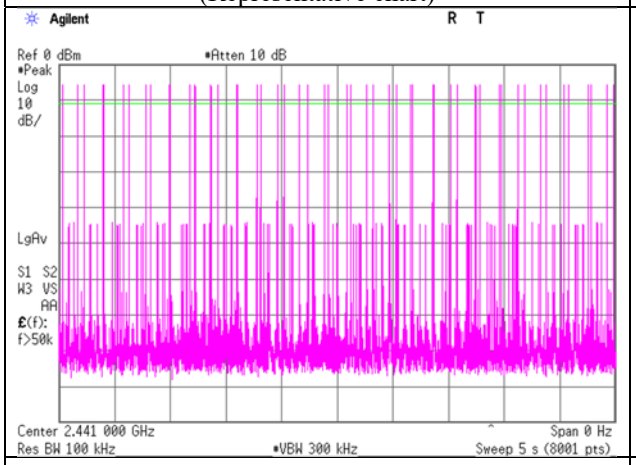
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	48	50	51	51	48	49.6
DH3	28	27	27	28	27	27.4
DH5	22	21	20	23	21	21.4
3DH1	48	50	49	49	49	49.0
3DH3	29	29	27	30	29	28.8
3DH5	20	22	22	20	22	21.2

Sample Calculation
Average = Summation (Sampling 1 to 5) / 5

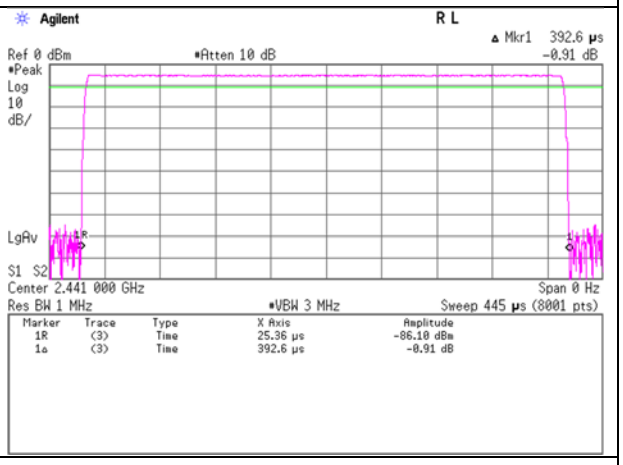
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless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

Dwell time

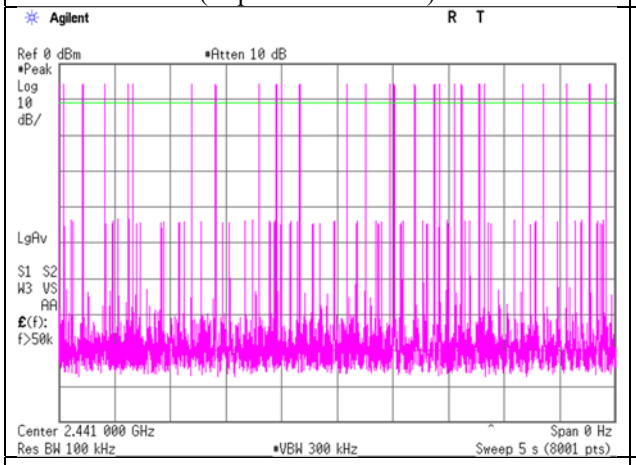
DH1 (1/2)
(Representative chart)



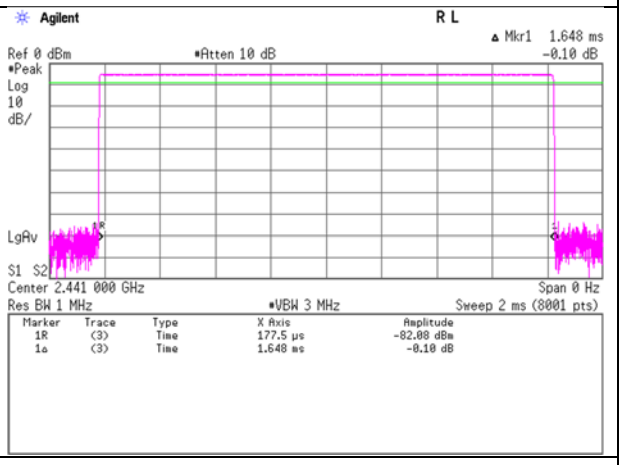
DH1 (2/2)



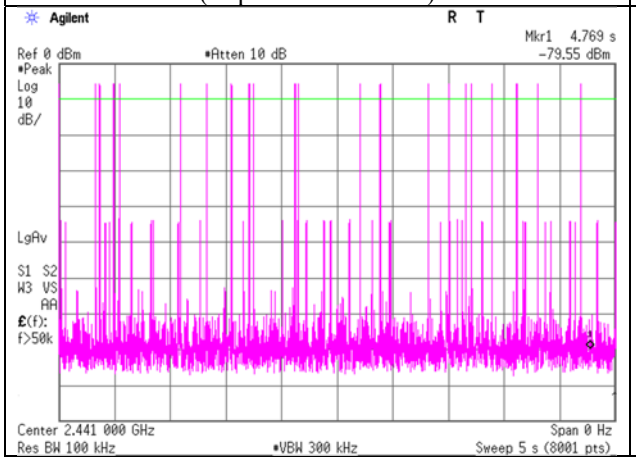
DH3 (1/2)
(Representative chart)



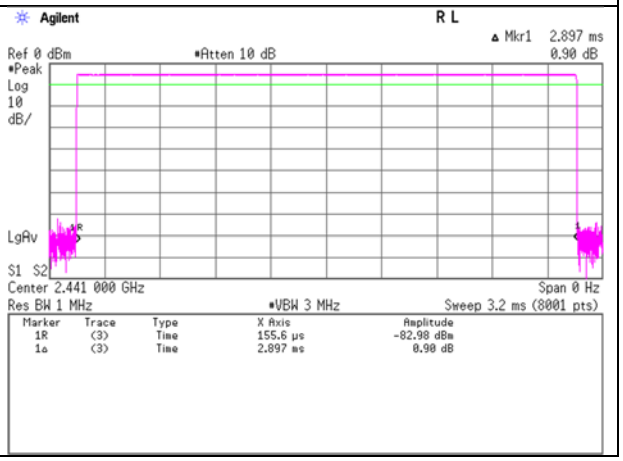
DH3 (2/2)



DH5 (1/2)
(Representative chart)

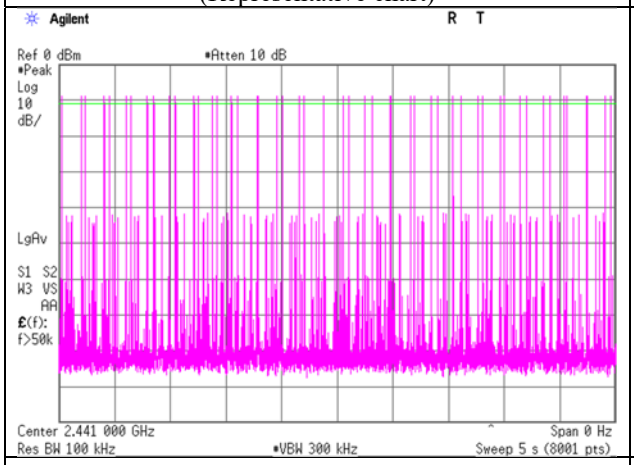


DH5 (2/2)

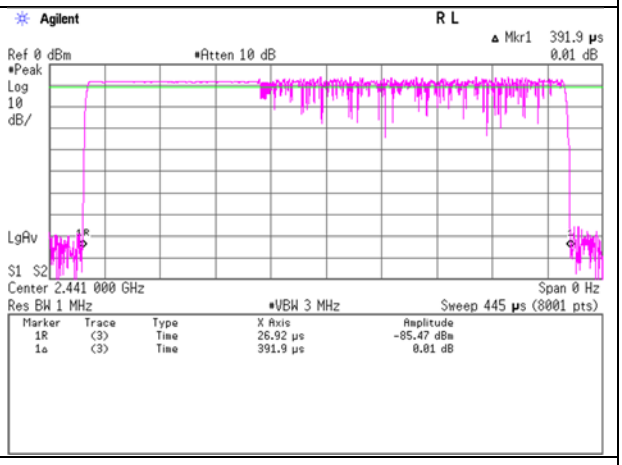


Dwell time

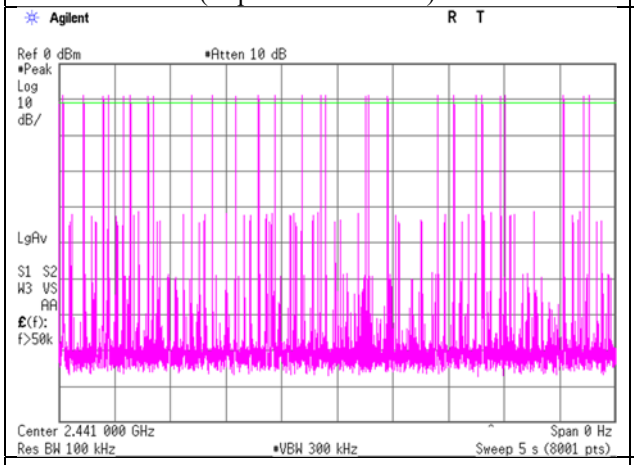
3DH1 (1/2)
(Representative chart)



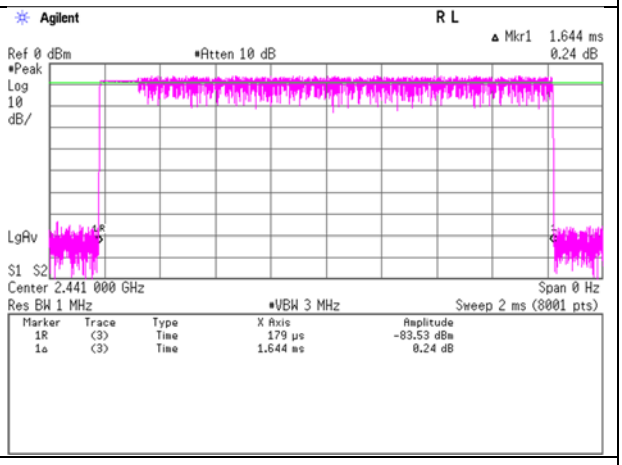
3DH1 (2/2)



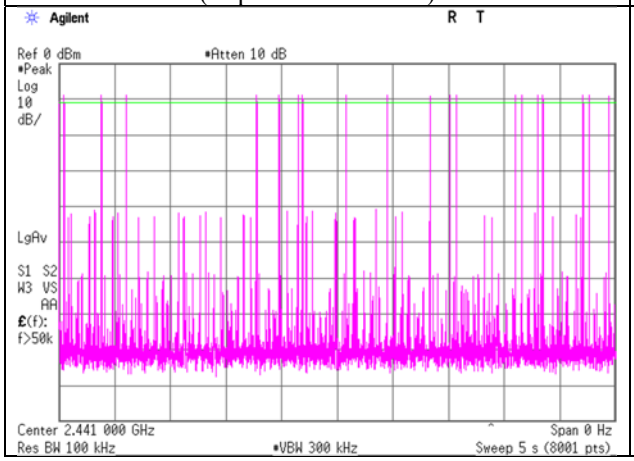
3DH3 (1/2)
(Representative chart)



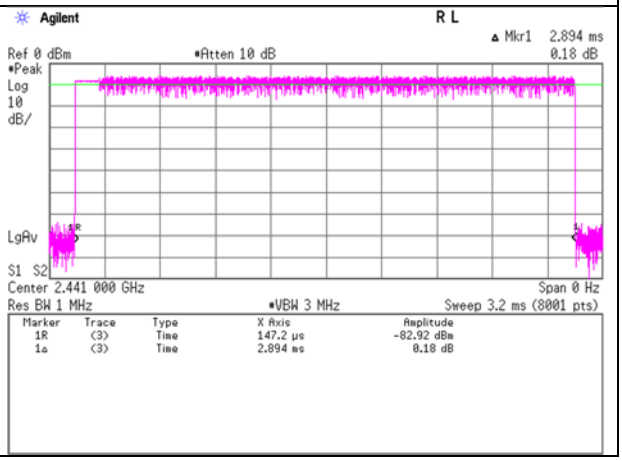
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 7, 2021
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Miku Ikudome
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	2402.0	-5.05	1.68	9.82	6.45	4.42	20.96	125	14.51	2.08	8.53	7.13	36.02	4000	27.49
DH5	2441.0	-5.09	1.68	9.82	6.41	4.38	20.96	125	14.55	2.08	8.49	7.06	36.02	4000	27.53
DH5	2480.0	-5.31	1.69	9.82	6.20	4.17	20.96	125	14.76	2.08	8.28	6.73	36.02	4000	27.74
2DH5	2402.0	-5.77	1.68	9.82	5.73	3.74	20.96	125	15.23	2.08	7.81	6.04	36.02	4000	28.21
2DH5	2441.0	-5.82	1.68	9.82	5.68	3.70	20.96	125	15.28	2.08	7.76	5.97	36.02	4000	28.26
2DH5	2480.0	-6.02	1.69	9.82	5.49	3.54	20.96	125	15.47	2.08	7.57	5.71	36.02	4000	28.45
3DH5	2402.0	-5.46	1.68	9.82	6.04	4.02	20.96	125	14.92	2.08	8.12	6.49	36.02	4000	27.90
3DH5	2441.0	-5.55	1.68	9.82	5.95	3.94	20.96	125	15.01	2.08	8.03	6.35	36.02	4000	27.99
3DH5	2480.0	-5.77	1.69	9.82	5.74	3.75	20.96	125	15.22	2.08	7.82	6.05	36.02	4000	28.20

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

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

Average Output Power
(Reference data for RF Exposure)

Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 7, 2021
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Miku Ikudome
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	2402.0	-6.33	1.68	9.82	5.17	3.29	1.12	6.29	4.26
DH5	2441.0	-6.37	1.68	9.82	5.13	3.26	1.12	6.25	4.22
DH5	2480.0	-6.60	1.69	9.82	4.91	3.10	1.12	6.03	4.01
2DH5	2402.0	-9.44	1.68	9.82	2.06	1.61	1.11	3.17	2.07
2DH5	2441.0	-9.49	1.68	9.82	2.01	1.59	1.11	3.12	2.05
2DH5	2480.0	-9.69	1.69	9.82	1.82	1.52	1.11	2.93	1.96
3DH5	2402.0	-9.44	1.68	9.82	2.06	1.61	1.12	3.18	2.08
3DH5	2441.0	-9.50	1.68	9.82	2.00	1.58	1.12	3.12	2.05
3DH5	2480.0	-9.69	1.69	9.82	1.82	1.52	1.12	2.94	1.97

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

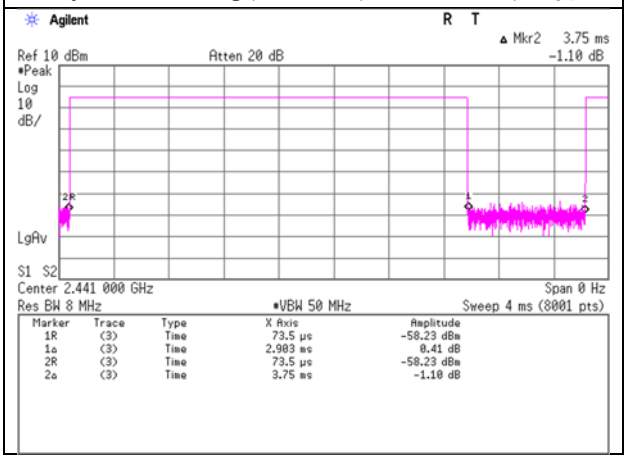
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 7, 2021
Temperature / Humidity	23 deg. C / 64 % RH
Engineer	Miku Ikudome
Mode	Tx, Hopping Off

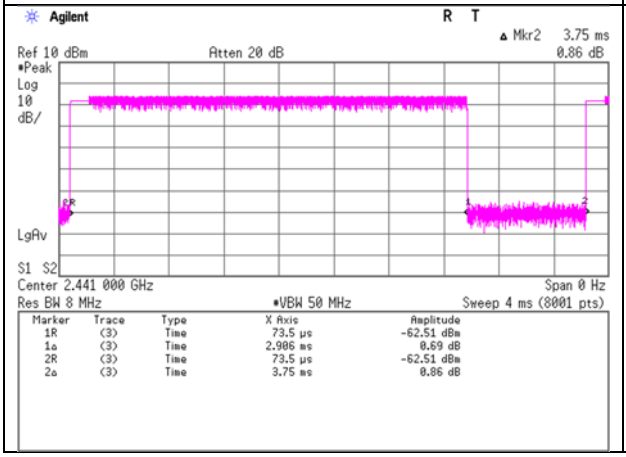
DH5

Tx on / (Tx on + Tx off) =	**0.774**
Tx on / (Tx on + Tx off) * 100 =	**77.4 %**
Duty factor = 10 * log (3.75 / 2.903) =	**1.12 dB**



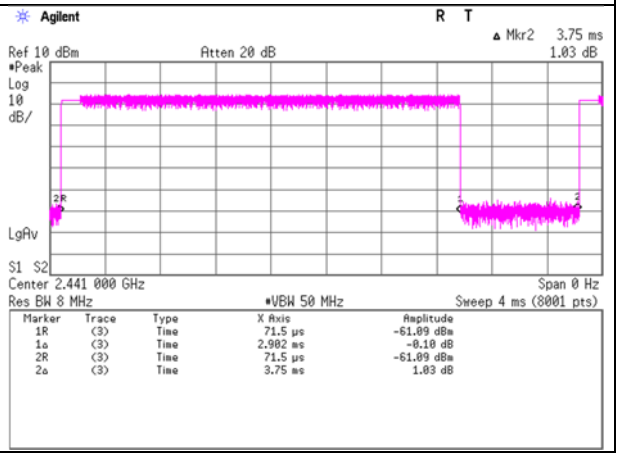
2DH5

Tx on / (Tx on + Tx off) =	**0.775**
Tx on / (Tx on + Tx off) * 100 =	**77.5 %**
Duty factor = 10 * log (3.75 / 2.906) =	**1.11 dB**



3DH5

Tx on / (Tx on + Tx off) =	**0.774**
Tx on / (Tx on + Tx off) * 100 =	**77.4 %**
Duty factor = 10 * log (3.75 / 2.902) =	**1.12 dB**



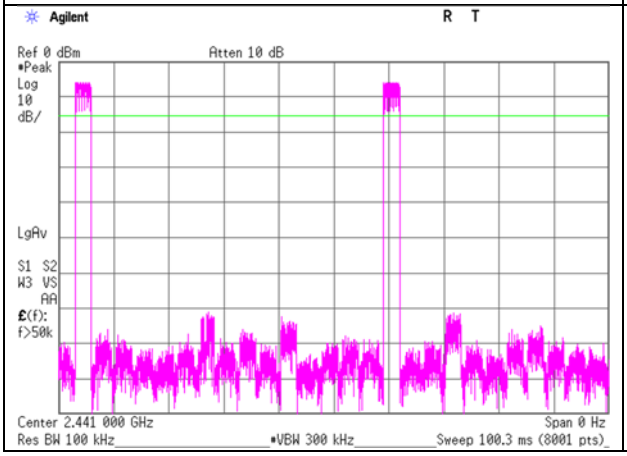
Duty cycle correction factor

Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping On

DH5

Tx On time **2.897 ms**

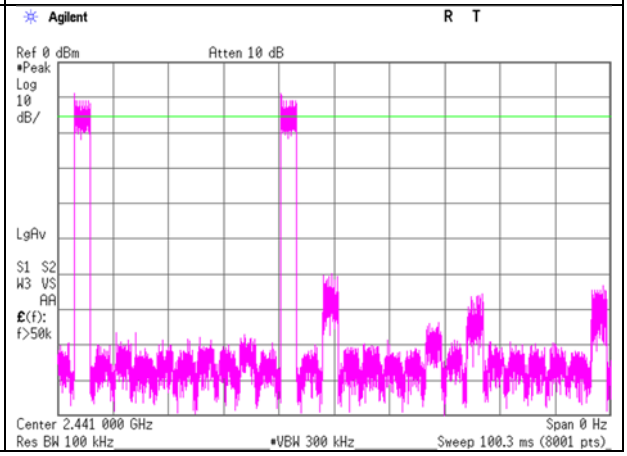
Duty Cycle Correction Factor = 20 * log (2.897 * 2 / 100) = **-24.74 dB**



3DH5

Tx On time **2.894 ms**

Duty Cycle Correction Factor = 20 * log (2.894 * 2 / 100) = **-24.74 dB**



*1) Tx On time refers to data of Dwell time.

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	3	3	3
Date	October 25, 2021	October 20, 2021	October 22, 2021	October 22, 2021
Temperature / Humidity	21 deg.C, 41 %RH	20 deg.C, 53 %RH	22 deg.C, 41 %RH	22 deg.C, 41 %RH
Engineer	Miku Ikudome	Yosuke Murakami	Miku Ikudome	Yosuke Murakami
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 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.	363.985	QP	40.90	15.28	8.89	31.93	0.00	33.14	46.0	12.8	100	23	-
Hori.	536.932	QP	33.00	17.63	9.65	31.95	0.00	28.33	46.0	17.6	100	14	-
Hori.	572.669	QP	33.10	18.47	9.79	31.93	0.00	29.43	46.0	16.5	114	1	-
Hori.	643.643	QP	38.40	19.19	10.05	31.92	0.00	35.72	46.0	10.2	104	186	-
Hori.	718.131	QP	35.50	20.05	10.34	31.80	0.00	34.09	46.0	11.9	100	182	-
Hori.	821.897	QP	29.50	20.98	10.69	31.45	0.00	29.72	46.0	16.2	100	218	-
Hori.	913.975	QP	29.90	22.07	10.98	30.91	0.00	32.04	46.0	13.9	100	220	-
Hori.	2390.000	PK	48.05	28.33	14.42	41.62	2.06	51.24	73.9	22.6	226	52	-
Hori.	4804.000	PK	51.22	31.77	7.03	42.89	2.06	49.19	73.9	24.7	112	275	-
Hori.	7206.000	PK	55.34	37.37	8.48	43.39	2.06	59.86	73.9	14.0	365	122	-
Hori.	9608.000	PK	50.18	39.12	9.67	43.18	2.06	57.85	73.9	16.0	150	0	-
Vert.	554.831	QP	34.10	18.04	9.73	31.95	0.00	29.92	46.0	16.0	100	166	-
Vert.	631.899	QP	39.30	19.32	10.00	31.91	0.00	36.71	46.0	**9.2**	128	219	-
Vert.	848.703	QP	31.20	21.45	10.79	31.34	0.00	32.10	46.0	13.9	148	1	-
Vert.	2390.000	PK	47.19	28.33	14.42	41.62	2.06	50.38	73.9	23.5	113	343	-
Vert.	4804.000	PK	51.38	31.77	7.03	42.89	2.06	49.35	73.9	24.5	142	339	-
Vert.	7206.000	PK	55.77	37.37	8.48	43.39	2.06	60.29	73.9	13.6	260	2	-
Vert.	9608.000	PK	50.81	39.12	9.67	43.18	2.06	58.48	73.9	15.4	150	0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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.	2390.000	PK	48.05	28.33	14.42	41.62	-24.74	2.06	26.50	53.9	27.4	*1)
Hori.	4804.000	PK	51.22	31.77	7.03	42.89	-24.74	2.06	24.45	53.9	29.4	-
Hori.	7206.000	PK	55.34	37.37	8.48	43.39	-24.74	2.06	35.12	53.9	18.7	-
Hori.	9608.000	PK	50.18	39.12	9.67	43.18	-24.74	2.06	33.11	53.9	20.7	-
Vert.	2390.000	PK	47.19	28.33	14.42	41.62	-24.74	2.06	25.64	53.9	28.2	*1)
Vert.	4804.000	PK	51.38	31.77	7.03	42.89	-24.74	2.06	24.61	53.9	29.2	-
Vert.	7206.000	PK	55.77	37.37	8.48	43.39	-24.74	2.06	35.55	53.9	18.3	-
Vert.	9608.000	PK	50.81	39.12	9.67	43.18	-24.74	2.06	33.74	53.9	20.1	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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)

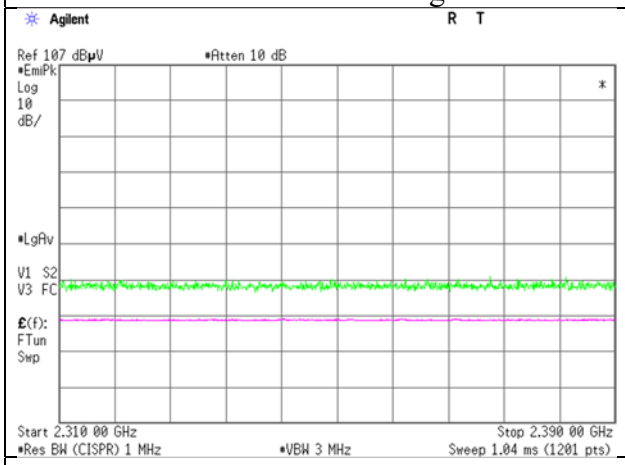
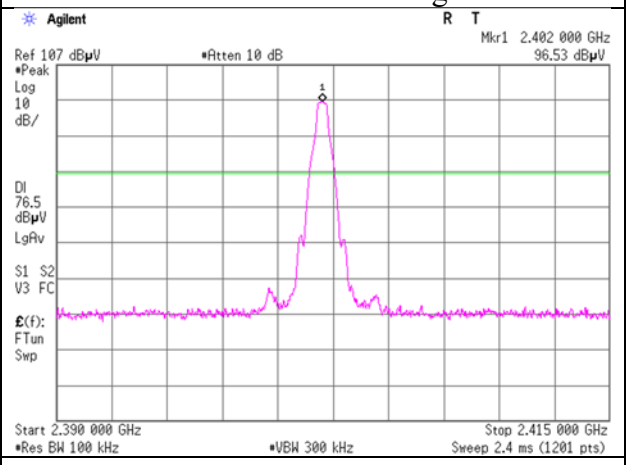
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

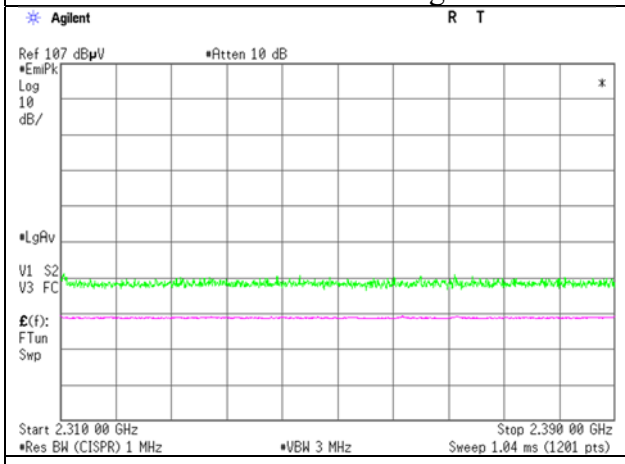
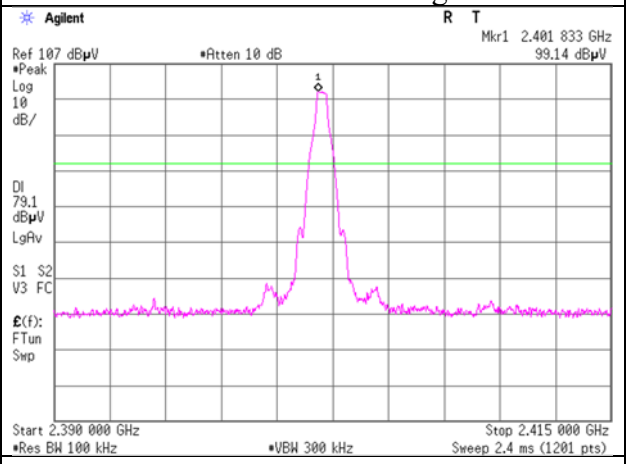
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	96.67	28.31	14.44	41.63	2.06	99.85	-	-	Carrier
Hori.	2399.580	PK	43.92	28.31	14.44	41.63	2.06	47.10	79.8	32.7	-
Hori.	2400.000	PK	42.35	28.31	14.44	41.63	2.06	45.53	79.8	34.2	-
Vert.	2402.000	PK	99.08	28.31	14.44	41.63	2.06	102.26	-	-	Carrier
Vert.	2399.700	PK	45.92	28.31	14.44	41.63	2.06	49.10	82.2	33.1	-
Vert.	2400.000	PK	42.40	28.31	14.44	41.63	2.06	45.58	82.2	36.6	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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	3
Date	October 20, 2021
Temperature / Humidity	20 deg.C, 53 %RH
Engineer	Yosuke Murakami
	(1 GHz -2.8 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	3	3	3	3
Date	October 25, 2021	October 20, 2021	October 22, 2021	October 22, 2021
Temperature / Humidity	21 deg.C, 41 %RH	20 deg.C, 53 %RH	22 deg.C, 41 %RH	22 deg.C, 41 %RH
Engineer	Miku Ikudome	Yosuke Murakami	Miku Ikudome	Yosuke Murakami
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 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.	537.287	QP	32.10	17.63	9.65	31.95	0.00	27.43	46.0	18.5	100	13	-
Hori.	572.831	QP	33.10	18.47	9.79	31.93	0.00	29.43	46.0	16.5	112	359	-
Hori.	650.054	QP	38.30	19.15	10.07	31.92	0.00	35.60	46.0	10.4	107	347	-
Hori.	718.118	QP	36.60	20.05	10.34	31.80	0.00	35.19	46.0	10.8	100	185	-
Hori.	828.245	QP	30.40	21.07	10.71	31.43	0.00	30.75	46.0	15.2	100	218	-
Hori.	4882.000	PK	49.99	31.87	7.08	42.89	2.06	48.11	73.9	25.7	122	37	-
Hori.	7323.000	PK	52.51	37.54	8.56	43.52	2.06	57.15	73.9	16.7	178	287	-
Hori.	9764.000	PK	48.32	39.41	9.76	42.97	2.06	56.58	73.9	17.3	150	0	-
Vert.	555.200	QP	34.40	18.05	9.73	31.95	0.00	30.23	46.0	15.7	100	169	-
Vert.	632.406	QP	38.20	19.31	10.01	31.91	0.00	35.61	46.0	**10.3**	100	49	-
Vert.	828.273	QP	30.40	21.08	10.71	31.43	0.00	30.76	46.0	15.2	100	204	-
Vert.	848.697	QP	32.00	21.45	10.79	31.34	0.00	32.90	46.0	13.1	157	2	-
Vert.	913.975	QP	30.60	22.07	10.98	30.91	0.00	32.74	46.0	13.2	100	181	-
Vert.	4882.000	PK	49.45	31.87	7.08	42.89	2.06	47.57	73.9	26.3	181	139	-
Vert.	7323.000	PK	53.53	37.54	8.56	43.52	2.06	58.17	73.9	15.7	127	31	-
Vert.	9764.000	PK	48.20	39.41	9.76	42.97	2.06	56.46	73.9	17.4	150	0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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.	4882.000	PK	49.99	31.87	7.08	42.89	-24.74	2.06	23.37	53.9	30.5	-
Hori.	7323.000	PK	52.51	37.54	8.56	43.52	-24.74	2.06	32.41	53.9	21.4	-
Hori.	9764.000	PK	48.32	39.41	9.76	42.97	-24.74	2.06	31.84	53.9	22.0	-
Vert.	4882.000	PK	49.45	31.87	7.08	42.89	-24.74	2.06	22.83	53.9	31.0	-
Vert.	7323.000	PK	53.53	37.54	8.56	43.52	-24.74	2.06	33.43	53.9	20.4	-
Vert.	9764.000	PK	48.20	39.41	9.76	42.97	-24.74	2.06	31.72	53.9	22.1	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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	3	3	3	3
Date	October 25, 2021	October 20, 2021	October 22, 2021	October 22, 2021
Temperature / Humidity	21 deg.C, 41 %RH	20 deg.C, 53 %RH	22 deg.C, 41 %RH	22 deg.C, 41 %RH
Engineer	Miku Ikudome	Yosuke Murakami	Miku Ikudome	Yosuke Murakami
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 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.	551.947	QP	35.00	17.97	9.72	31.96	0.00	30.73	46.0	15.2	100	117	-
Hori.	650.051	QP	39.00	19.15	10.07	31.92	0.00	36.30	46.0	9.7	155	32	-
Hori.	697.586	QP	35.90	19.93	10.28	31.83	0.00	34.28	46.0	11.7	112	172	-
Hori.	718.123	QP	37.10	20.05	10.34	31.80	0.00	35.69	46.0	10.3	100	186	-
Hori.	825.276	QP	29.20	21.03	10.70	31.44	0.00	29.49	46.0	16.5	100	221	-
Hori.	913.981	QP	29.50	22.07	10.98	30.91	0.00	31.64	46.0	14.3	100	265	-
Hori.	2483.500	PK	47.83	28.24	14.52	41.65	2.06	51.00	73.9	22.9	157	42	-
Hori.	2487.336	PK	49.04	28.24	14.52	41.66	2.06	52.20	73.9	21.7	157	42	-
Hori.	4960.000	PK	50.65	32.14	7.14	42.89	2.06	49.10	73.9	24.8	127	207	-
Hori.	7440.000	PK	52.24	37.62	8.63	43.65	2.06	56.90	73.9	17.0	137	283	-
Hori.	9920.000	PK	47.37	39.30	9.84	42.77	2.06	55.80	73.9	18.1	150	0	-
Vert.	626.425	QP	40.00	19.45	9.99	31.91	0.00	37.53	46.0	**8.4**	100	219	-
Vert.	848.699	QP	32.40	21.45	10.79	31.34	0.00	33.30	46.0	12.7	153	3	-
Vert.	913.978	QP	30.80	22.07	10.98	30.91	0.00	32.94	46.0	13.0	100	182	-
Vert.	2483.500	PK	48.90	28.24	14.52	41.65	2.06	52.07	73.9	21.8	103	342	-
Vert.	2487.515	PK	49.15	28.24	14.52	41.66	2.06	52.31	73.9	21.5	103	342	-
Vert.	4960.000	PK	50.59	32.14	7.14	42.89	2.06	49.04	73.9	24.8	115	153	-
Vert.	7440.000	PK	52.65	37.62	8.63	43.65	2.06	57.31	73.9	16.5	129	186	-
Vert.	9920.000	PK	46.67	39.30	9.84	42.77	2.06	55.10	73.9	18.8	150	0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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	47.83	28.24	14.52	41.65	-24.74	2.06	26.26	53.9	27.6	*1)
Hori.	2487.336	PK	49.04	28.24	14.52	41.66	-24.74	2.06	27.46	53.9	26.4	-
Hori.	4960.000	PK	50.65	32.14	7.14	42.89	-24.74	2.06	24.36	53.9	29.5	-
Hori.	7440.000	PK	52.24	37.62	8.63	43.65	-24.74	2.06	32.16	53.9	21.7	-
Hori.	9920.000	PK	47.37	39.30	9.84	42.77	-24.74	2.06	31.06	53.9	22.8	-
Vert.	2483.500	PK	48.90	28.24	14.52	41.65	-24.74	2.06	27.33	53.9	26.5	*1)
Vert.	2487.515	PK	49.15	28.24	14.52	41.66	-24.74	2.06	27.57	53.9	26.3	-
Vert.	4960.000	PK	50.59	32.14	7.14	42.89	-24.74	2.06	24.30	53.9	29.6	-
Vert.	7440.000	PK	52.65	37.62	8.63	43.65	-24.74	2.06	32.57	53.9	21.3	-
Vert.	9920.000	PK	46.67	39.30	9.84	42.77	-24.74	2.06	30.36	53.9	23.5	-

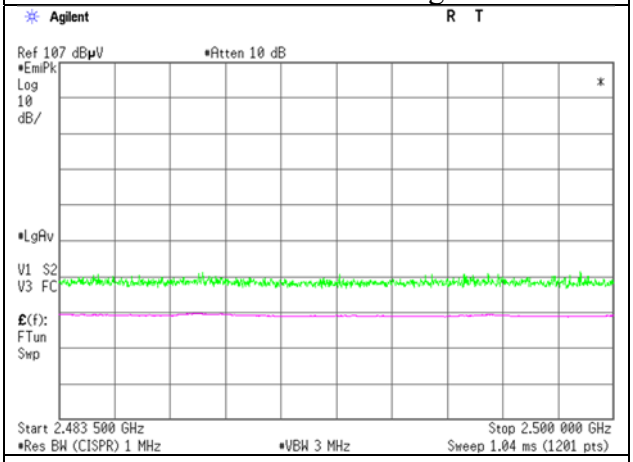
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction 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	3
Date	October 20, 2021
Temperature / Humidity	20 deg.C, 53 %RH
Engineer	Yosuke Murakami (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz

Horizontal

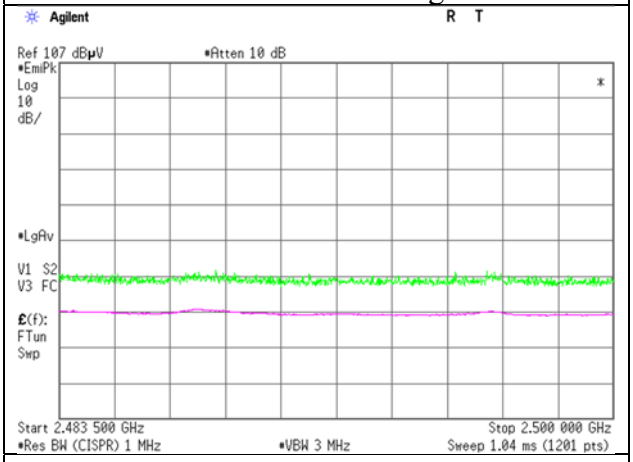
Restricted-band band-edge Plot



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	3	3	3	3
Date	October 25, 2021	October 20, 2021	October 22, 2021	October 22, 2021
Temperature / Humidity	21 deg.C, 41 %RH	20 deg.C, 53 %RH	22 deg.C, 41 %RH	22 deg.C, 41 %RH
Engineer	Miku Ikudome	Yosuke Murakami	Miku Ikudome	Yosuke Murakami
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 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.	555.183	QP	37.80	18.05	9.73	31.95	0.00	33.63	46.0	12.3	169	25	-
Hori.	661.852	QP	38.40	19.30	10.12	31.90	0.00	35.92	46.0	10.0	100	358	-
Hori.	697.555	QP	35.80	19.93	10.28	31.83	0.00	34.18	46.0	11.8	110	170	-
Hori.	824.706	QP	30.20	21.02	10.70	31.44	0.00	30.48	46.0	15.5	100	153	-
Hori.	913.975	QP	31.10	22.07	10.98	30.91	0.00	33.24	46.0	12.7	100	265	-
Hori.	2390.000	PK	47.20	28.33	14.42	41.62	2.06	50.39	73.9	23.5	222	50	-
Hori.	4804.000	PK	50.18	31.77	7.03	42.89	2.06	48.15	73.9	25.7	114	266	-
Hori.	7206.000	PK	53.40	37.37	8.48	43.39	2.06	57.92	73.9	15.9	155	121	-
Hori.	9608.000	PK	50.10	39.12	9.67	43.18	2.06	57.77	73.9	16.1	150	0	-
Vert.	549.072	QP	32.80	17.89	9.71	31.96	0.00	28.44	46.0	17.5	100	48	-
Vert.	626.237	QP	40.40	19.46	9.98	31.91	0.00	37.93	46.0	**8.0**	111	223	-
Vert.	697.605	QP	32.10	19.93	10.28	31.83	0.00	30.48	46.0	15.5	118	351	-
Vert.	828.233	QP	30.90	21.07	10.71	31.43	0.00	31.25	46.0	14.7	100	175	-
Vert.	913.977	QP	31.90	22.07	10.98	30.91	0.00	34.04	46.0	11.9	152	184	-
Vert.	2390.000	PK	48.62	28.33	14.42	41.62	2.06	51.81	73.9	22.0	156	347	-
Vert.	4804.000	PK	49.84	31.77	7.03	42.89	2.06	47.81	73.9	26.0	176	256	-
Vert.	7206.000	PK	53.95	37.37	8.48	43.39	2.06	58.47	73.9	15.4	119	335	-
Vert.	9608.000	PK	50.00	39.12	9.67	43.18	2.06	57.67	73.9	16.2	150	0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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.	2390.000	PK	47.20	28.33	14.42	41.62	-24.74	2.06	25.65	53.9	28.2	*1)
Hori.	4804.000	PK	50.18	31.77	7.03	42.89	-24.74	2.06	23.41	53.9	30.4	-
Hori.	7206.000	PK	53.40	37.37	8.48	43.39	-24.74	2.06	33.18	53.9	20.7	-
Hori.	9608.000	PK	50.10	39.12	9.67	43.18	-24.74	2.06	33.03	53.9	20.8	-
Vert.	2390.000	PK	48.62	28.33	14.42	41.62	-24.74	2.06	27.07	53.9	26.8	*1)
Vert.	4804.000	PK	49.84	31.77	7.03	42.89	-24.74	2.06	23.07	53.9	30.8	-
Vert.	7206.000	PK	53.95	37.37	8.48	43.39	-24.74	2.06	33.73	53.9	20.1	-
Vert.	9608.000	PK	50.00	39.12	9.67	43.18	-24.74	2.06	32.93	53.9	20.9	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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)

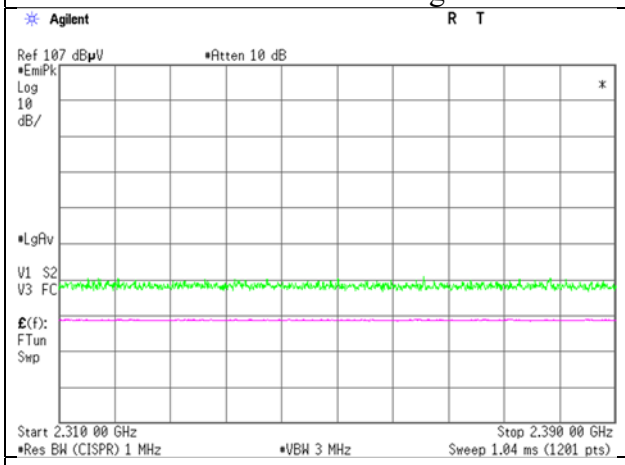
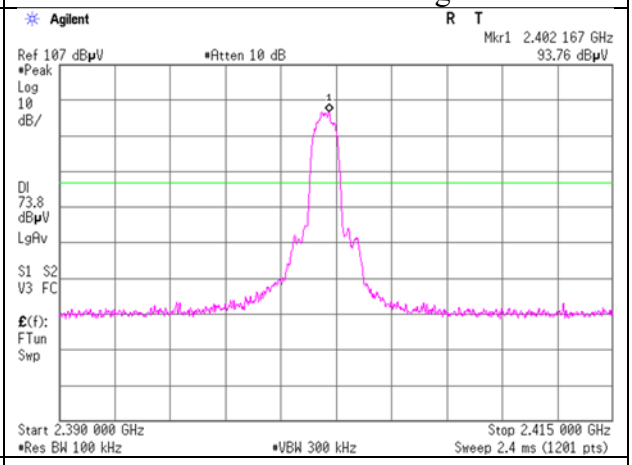
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

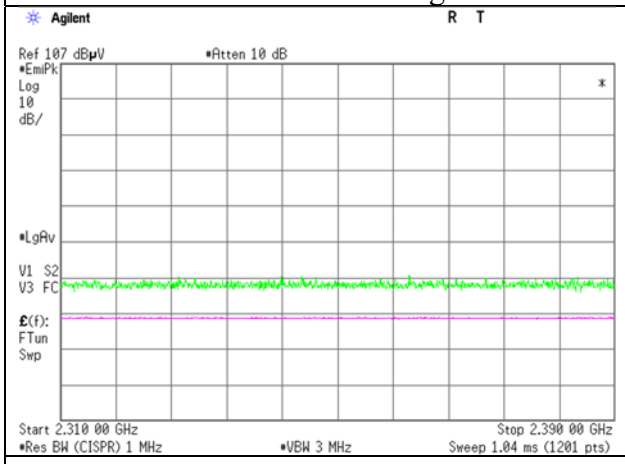
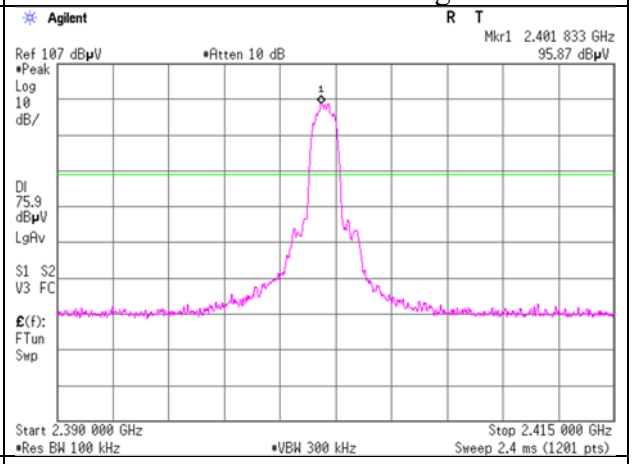
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	93.72	28.31	14.44	41.63	2.06	96.90	-	-	Carrier
Hori.	2400.000	PK	47.04	28.31	14.44	41.63	2.06	50.22	76.9	26.6	-
Vert.	2402.000	PK	95.88	28.31	14.44	41.63	2.06	99.06	-	-	Carrier
Vert.	2400.000	PK	48.01	28.31	14.44	41.63	2.06	51.19	79.0	27.8	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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	3
Date	October 20, 2021
Temperature / Humidity	20 deg.C, 53 %RH
Engineer	Yosuke Murakami
	(1 GHz -2.8 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	3	3	3	3
Date	October 25, 2021	October 20, 2021	October 22, 2021	October 22, 2021
Temperature / Humidity	21 deg.C, 41 %RH	20 deg.C, 53 %RH	22 deg.C, 41 %RH	22 deg.C, 41 %RH
Engineer	Miku Ikudome	Yosuke Murakami	Miku Ikudome	Yosuke Murakami
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 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.	555.285	QP	37.70	18.05	9.73	31.95	0.00	33.53	46.0	12.4	169	27	-
Hori.	662.020	QP	38.70	19.30	10.12	31.90	0.00	36.22	46.0	9.7	100	357	-
Hori.	697.633	QP	35.60	19.93	10.28	31.83	0.00	33.98	46.0	12.0	109	169	-
Hori.	834.189	QP	29.10	21.16	10.73	31.40	0.00	29.59	46.0	16.4	100	223	-
Hori.	913.984	QP	31.10	22.07	10.98	30.91	0.00	33.24	46.0	12.7	100	266	-
Hori.	4882.000	PK	48.85	31.87	7.08	42.89	2.06	46.97	73.9	26.9	136	11	-
Hori.	7323.000	PK	50.84	37.54	8.56	43.52	2.06	55.48	73.9	18.4	208	21	-
Hori.	9764.000	PK	48.14	39.41	9.76	42.97	2.06	56.40	73.9	17.5	150	0	-
Vert.	566.841	QP	31.20	18.35	9.77	31.94	0.00	27.38	46.0	18.6	100	46	-
Vert.	638.291	QP	40.10	19.25	10.03	31.92	0.00	37.46	46.0	**8.5**	100	228	-
Vert.	697.401	QP	32.20	19.92	10.28	31.83	0.00	30.57	46.0	15.4	122	350	-
Vert.	827.932	QP	31.00	21.07	10.71	31.43	0.00	31.35	46.0	14.6	100	174	-
Vert.	913.973	QP	32.50	22.07	10.98	30.91	0.00	34.64	46.0	11.3	100	191	-
Vert.	4882.000	PK	50.51	31.87	7.08	42.89	2.06	48.63	73.9	25.2	146	195	-
Vert.	7323.000	PK	52.46	37.54	8.56	43.52	2.06	57.10	73.9	16.8	113	31	-
Vert.	9764.000	PK	48.17	39.41	9.76	42.97	2.06	56.43	73.9	17.4	150	0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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.	4882.000	PK	48.85	31.87	7.08	42.89	-24.74	2.06	22.23	53.9	31.6	-
Hori.	7323.000	PK	50.84	37.54	8.56	43.52	-24.74	2.06	30.74	53.9	23.1	-
Hori.	9764.000	PK	48.14	39.41	9.76	42.97	-24.74	2.06	31.66	53.9	22.2	-
Vert.	4882.000	PK	50.51	31.87	7.08	42.89	-24.74	2.06	23.89	53.9	30.0	-
Vert.	7323.000	PK	52.46	37.54	8.56	43.52	-24.74	2.06	32.36	53.9	21.5	-
Vert.	9764.000	PK	48.17	39.41	9.76	42.97	-24.74	2.06	31.69	53.9	22.2	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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	3	3	3	3
Date	October 25, 2021	October 20, 2021	October 22, 2021	October 22, 2021
Temperature / Humidity	21 deg.C, 41 %RH	20 deg.C, 53 %RH	22 deg.C, 41 %RH	22 deg.C, 41 %RH
Engineer	Takahiro Suzuki	Yosuke Murakami	Miku Ikudome	Yosuke Murakami
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 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.	554.896	QP	36.73	18.04	9.73	31.95	0.00	32.55	46.0	13.4	165	21	-
Hori.	661.349	QP	37.79	19.29	10.12	31.90	0.00	35.30	46.0	10.7	100	358	-
Hori.	697.487	QP	35.92	19.92	10.28	31.83	0.00	34.29	46.0	11.7	113	164	-
Hori.	834.223	QP	29.64	21.16	10.73	31.40	0.00	30.13	46.0	15.8	100	225	-
Hori.	913.972	QP	32.05	22.07	10.98	30.91	0.00	34.19	46.0	11.8	100	214	-
Hori.	2483.500	PK	49.19	28.24	14.52	41.65	2.06	52.36	73.9	21.5	158	42	-
Hori.	4960.000	PK	49.09	32.14	7.14	42.89	2.06	47.54	73.9	26.3	131	330	-
Hori.	7440.000	PK	51.94	37.62	8.63	43.65	2.06	56.60	73.9	17.3	111	282	-
Hori.	9920.000	PK	47.30	39.30	9.84	42.77	2.06	55.73	73.9	18.1	150	0	-
Vert.	549.339	QP	34.47	17.90	9.71	31.96	0.00	30.12	46.0	15.8	100	160	-
Vert.	627.055	QP	37.85	19.44	9.99	31.91	0.00	35.37	46.0	**10.6**	100	222	-
Vert.	696.902	QP	32.78	19.92	10.28	31.84	0.00	31.14	46.0	14.8	124	355	-
Vert.	848.676	QP	31.23	21.45	10.79	31.34	0.00	32.13	46.0	13.8	153	359	-
Vert.	913.931	QP	31.93	22.07	10.98	30.91	0.00	34.07	46.0	11.9	100	185	-
Vert.	2483.500	PK	51.57	28.24	14.52	41.65	2.06	54.74	73.9	19.1	103	341	-
Vert.	4960.000	PK	50.66	32.14	7.14	42.89	2.06	49.11	73.9	24.7	209	152	-
Vert.	7440.000	PK	50.84	37.62	8.63	43.65	2.06	55.50	73.9	18.4	152	162	-
Vert.	9920.000	PK	47.48	39.30	9.84	42.77	2.06	55.91	73.9	17.9	150	0	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 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	49.19	28.24	14.52	41.65	-24.74	2.06	27.62	53.9	26.2	*1)
Hori.	4960.000	PK	49.09	32.14	7.14	42.89	-24.74	2.06	22.80	53.9	31.1	-
Hori.	7440.000	PK	51.94	37.62	8.63	43.65	-24.74	2.06	31.86	53.9	22.0	-
Hori.	9920.000	PK	47.30	39.30	9.84	42.77	-24.74	2.06	30.99	53.9	22.9	-
Vert.	2483.500	PK	51.57	28.24	14.52	41.65	-24.74	2.06	30.00	53.9	23.9	*1)
Vert.	4960.000	PK	50.66	32.14	7.14	42.89	-24.74	2.06	24.37	53.9	29.5	-
Vert.	7440.000	PK	50.84	37.62	8.63	43.65	-24.74	2.06	30.76	53.9	23.1	-
Vert.	9920.000	PK	47.48	39.30	9.84	42.77	-24.74	2.06	31.17	53.9	22.7	-

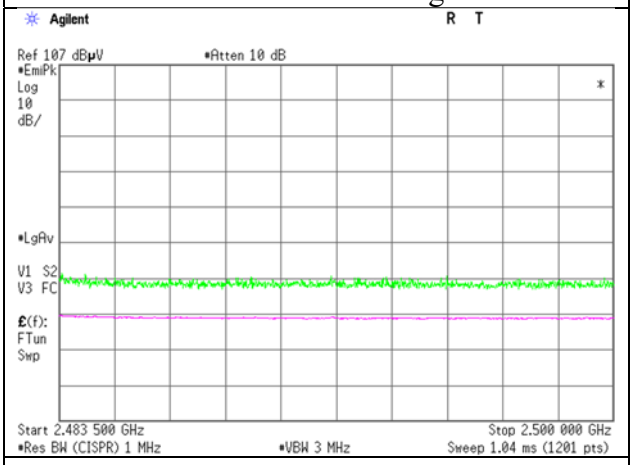
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.80 m / 3.0 m) = 2.06 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction 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	3
Date	October 20, 2021
Temperature / Humidity	20 deg.C, 53 %RH
Engineer	Yosuke Murakami
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

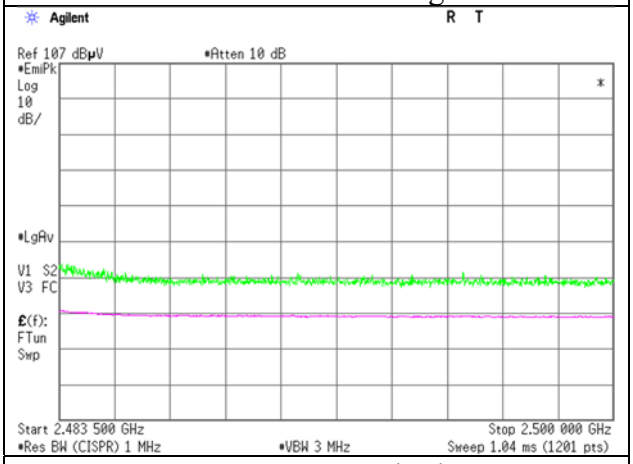
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

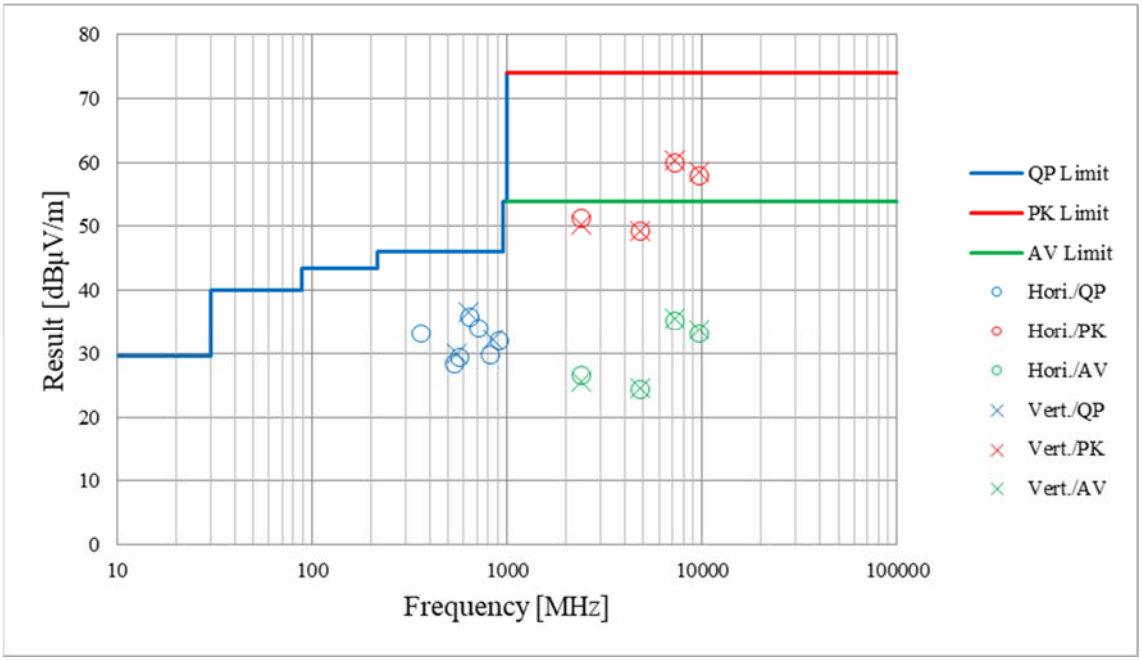


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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	3	3	3	3
Date	October 25, 2021	October 20, 2021	October 22, 2021	October 22, 2021
Temperature / Humidity	21 deg.C, 41 %RH	20 deg.C, 53 %RH	22 deg.C, 41 %RH	22 deg.C, 41 %RH
Engineer	Miku Ikudome	Yosuke Murakami	Miku Ikudome	Yosuke Murakami
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz			



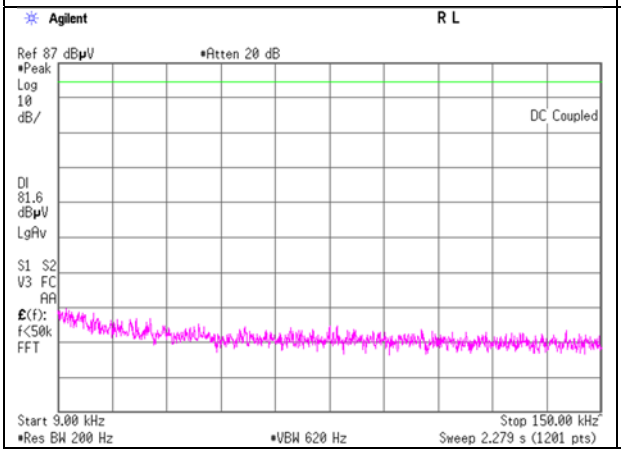
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

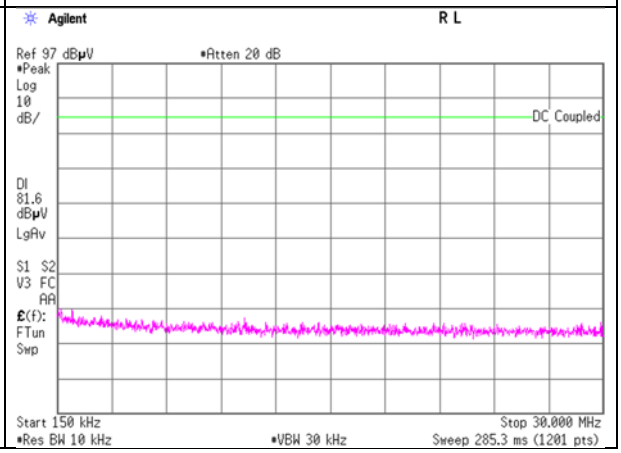
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

2402 MHz

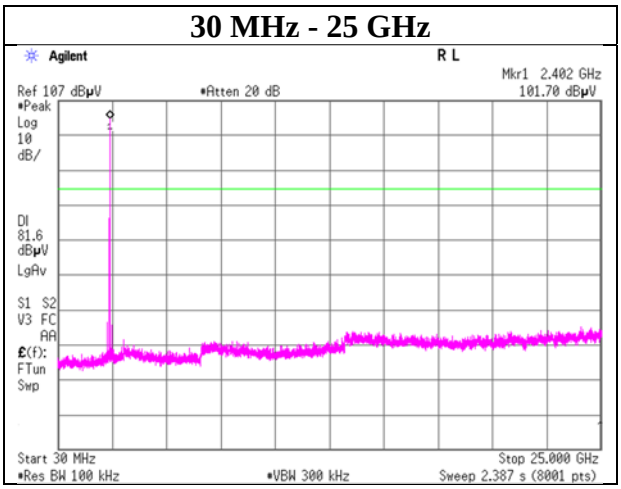
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

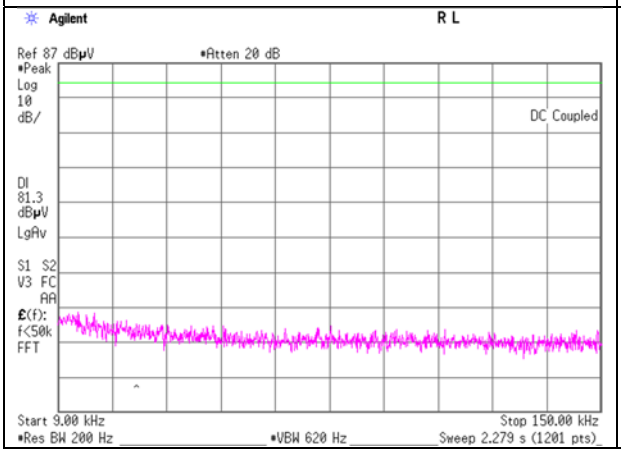


Conducted Spurious Emission

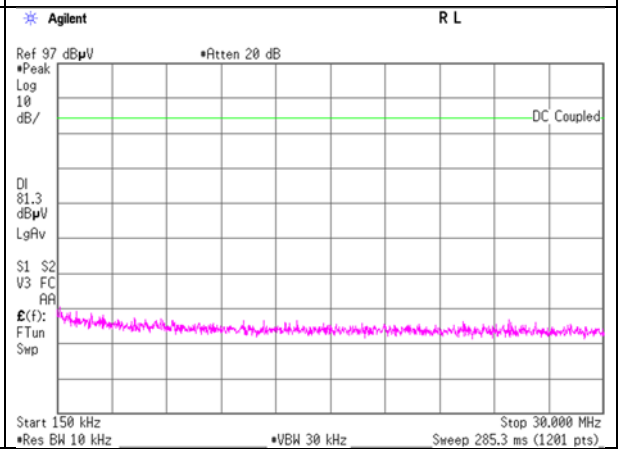
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

2441 MHz

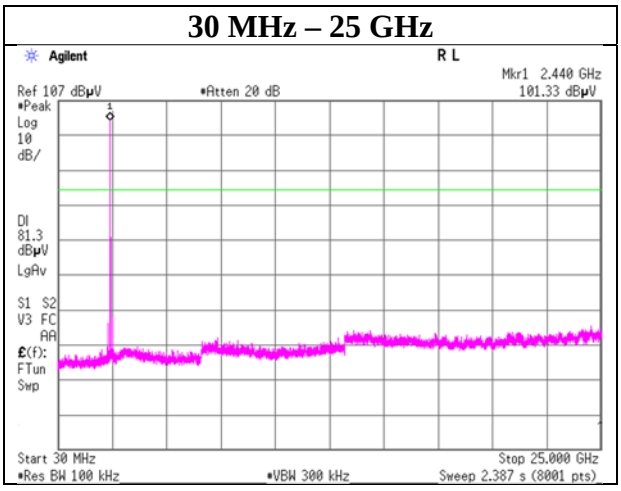
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

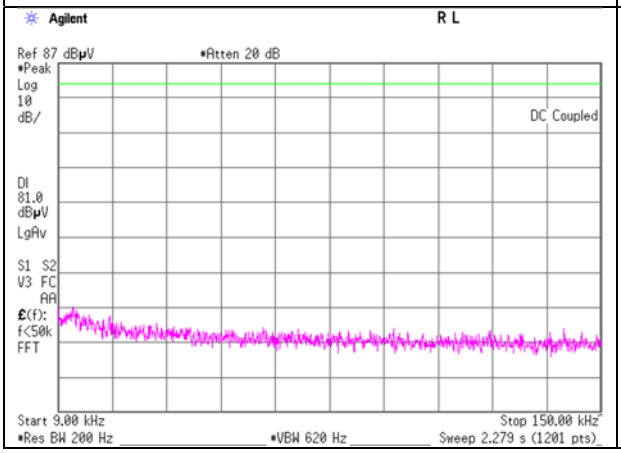


Conducted Spurious Emission

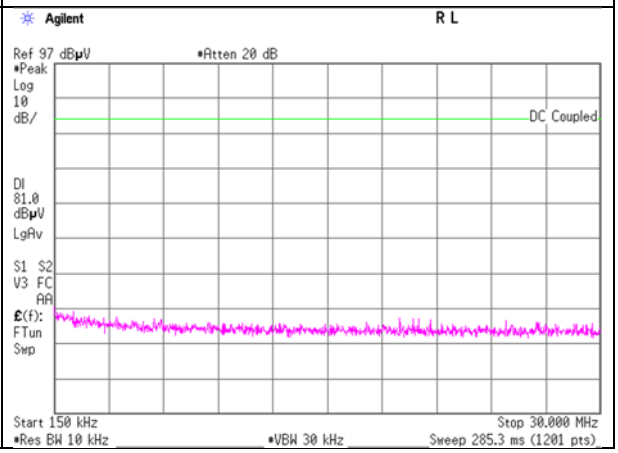
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, DH5

2480 MHz

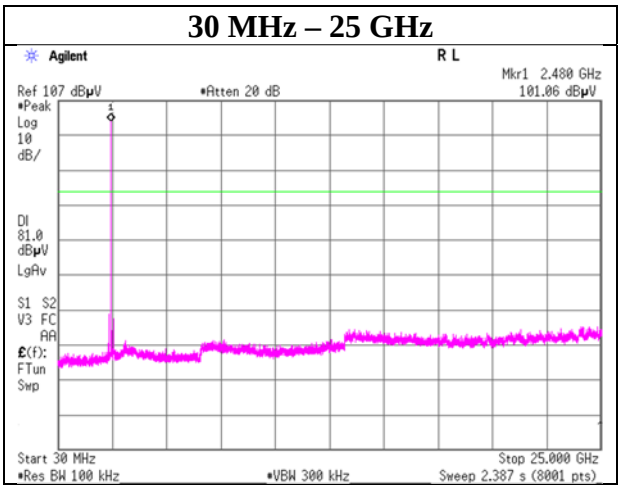
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

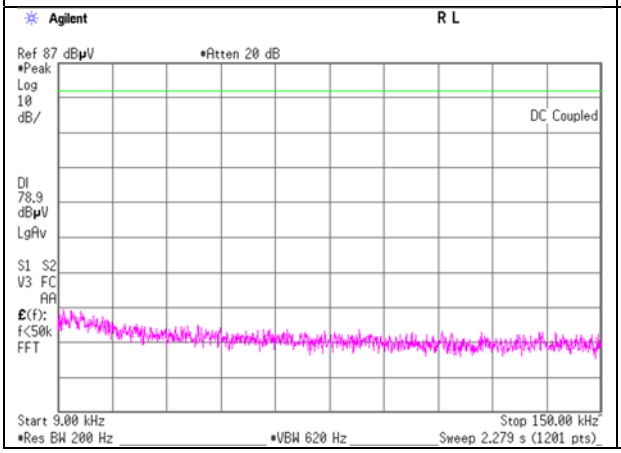


Conducted Spurious Emission

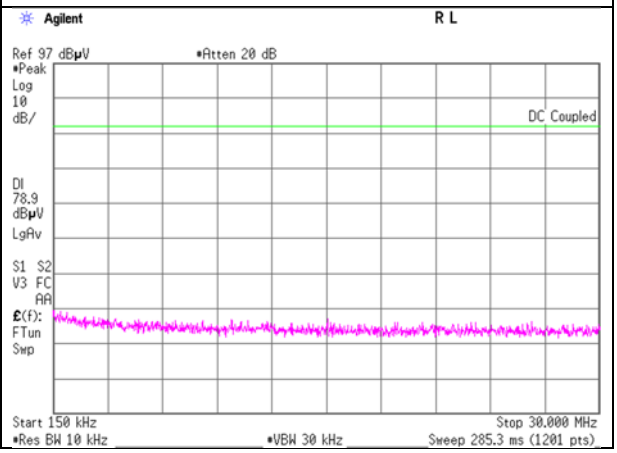
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping On, 3DH5

2402 MHz

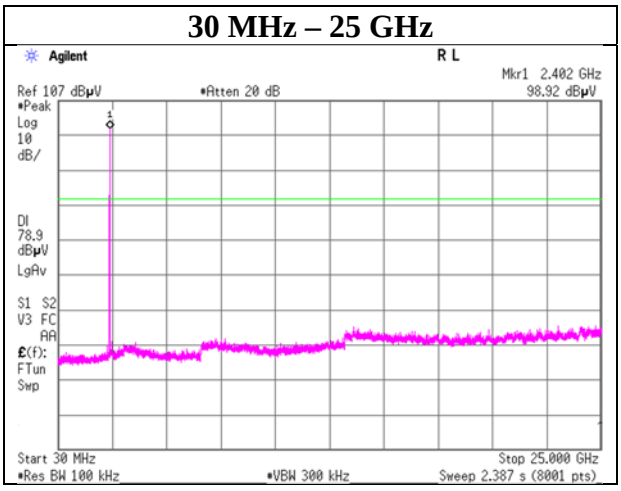
9 kHz – 150 kHz



150 kHz – 30 MHz



30 MHz – 25 GHz

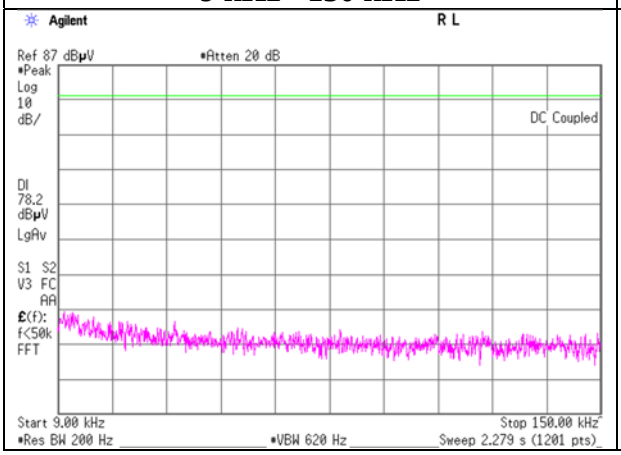


Conducted Spurious Emission

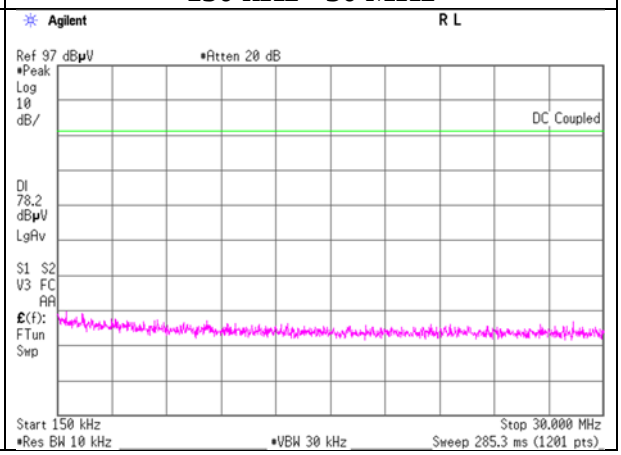
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2441 MHz

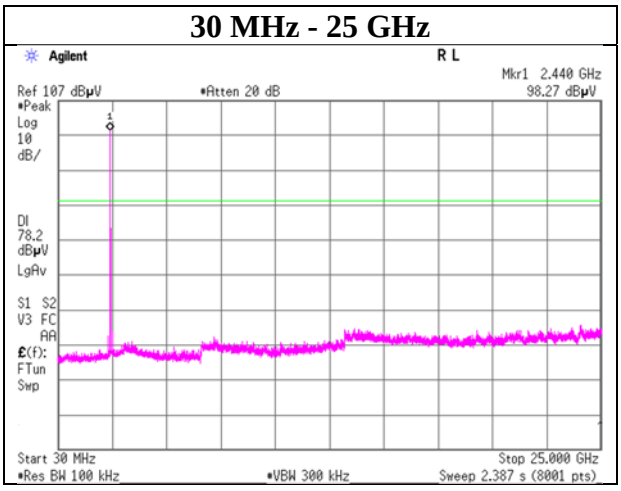
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

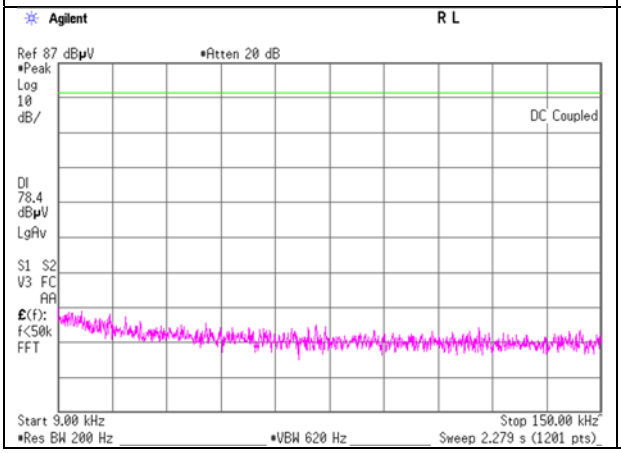


Conducted Spurious Emission

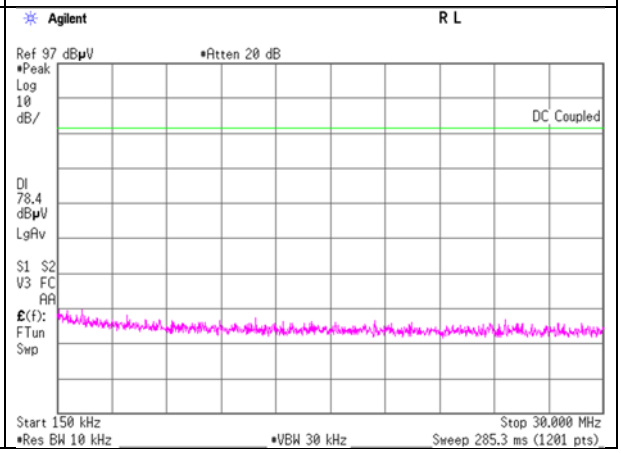
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx, Hopping Off, 3DH5

2480 MHz

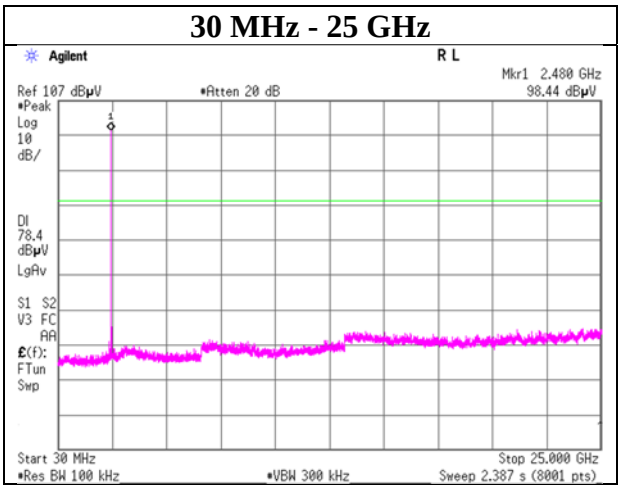
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

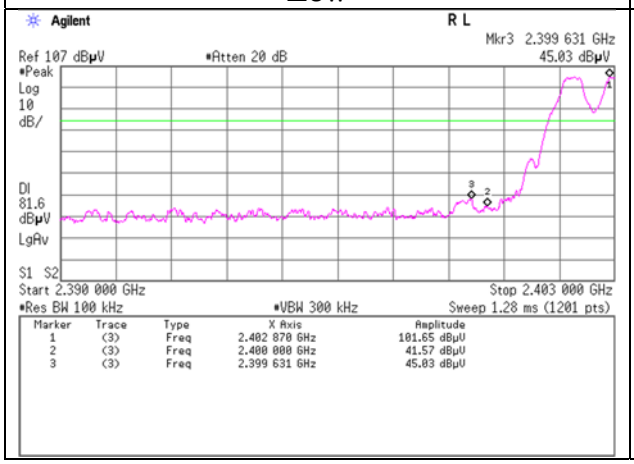


Conducted Emission Band Edge compliance

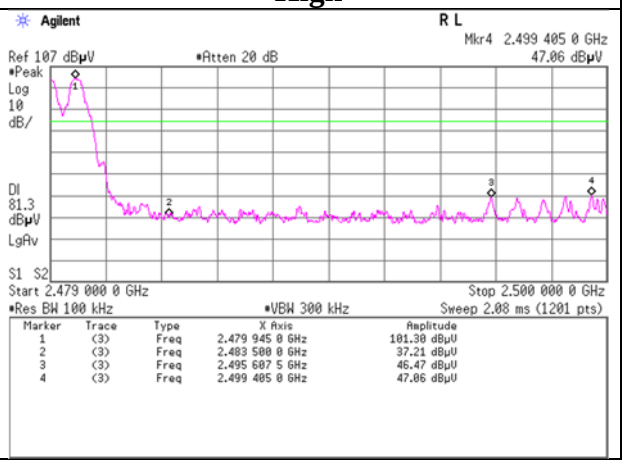
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx DH5

Hopping On

Low

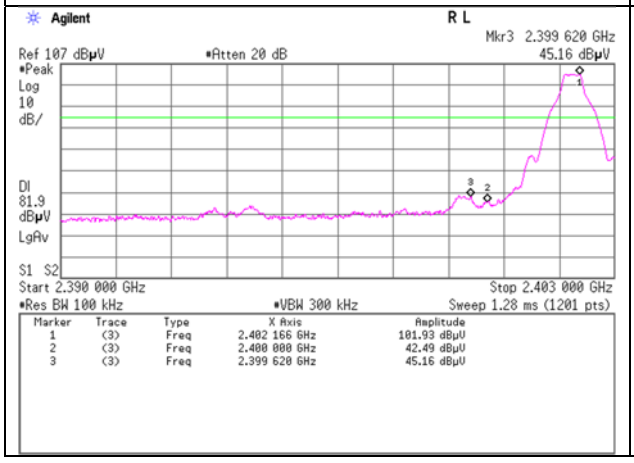


High

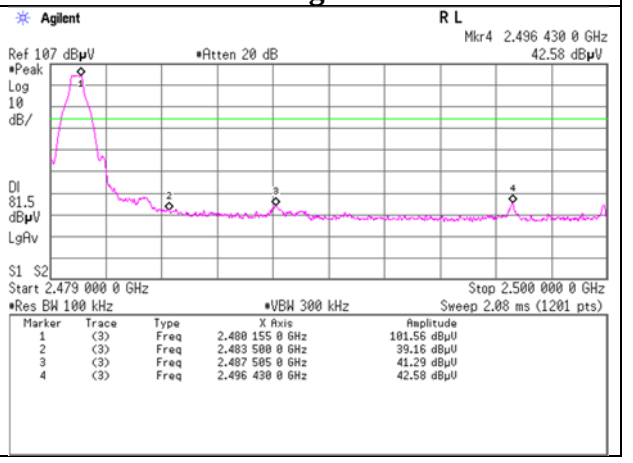


Hopping Off

Low



High

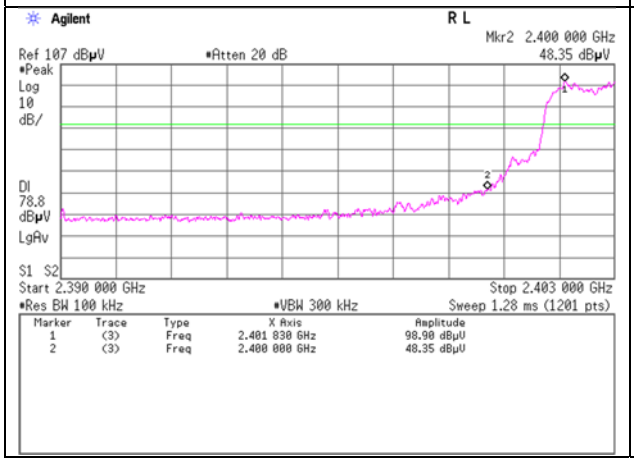


Conducted Emission Band Edge compliance

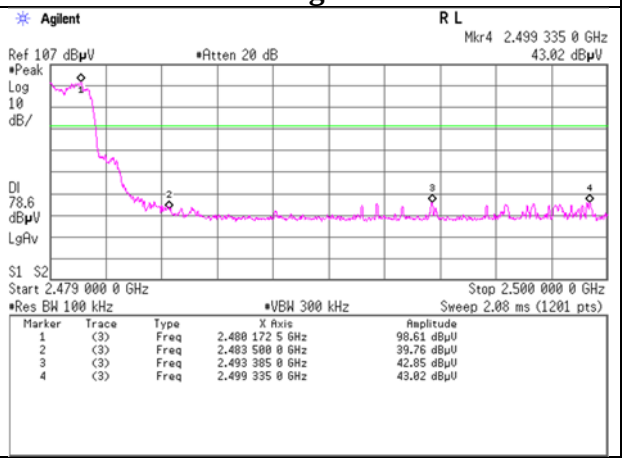
Report No.	14033198S-A-R1
Test place	Shonan EMC Lab. No.3 Shielded Room
Date	October 15, 2021
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Shiro Kobayashi
Mode	Tx 3DH5

Hopping On

Low

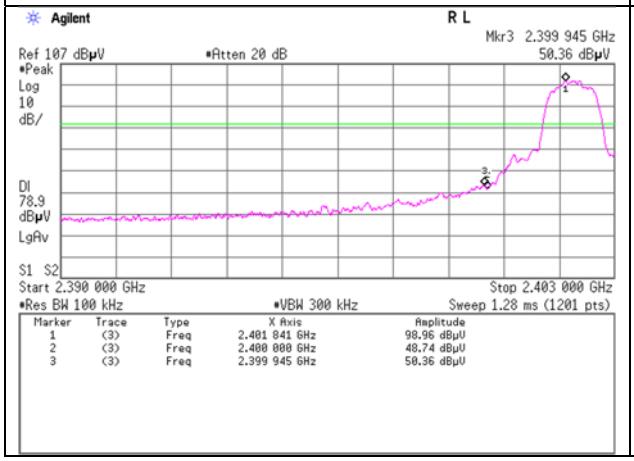


High

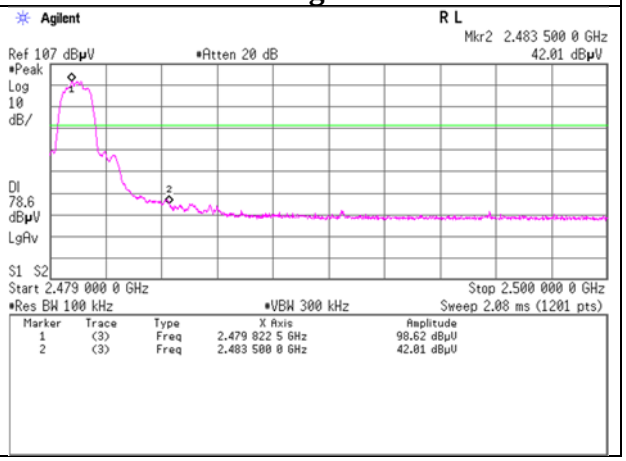


Hopping Off

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	SAT10-14	154591	Attenuator	Weinschel Corp.	54A-10	81595	2021/04/08	12
AT	SCC-G63	196946	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803411/2	2021/03/01	12
AT	SOS-27	191845	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
AT	SPM-07	146247	Power Meter	Keysight Technologies Inc	8990B	MY5100272	2021/05/25	12
AT	SPSS-04	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2021/05/25	12
AT	SRENT-22	202830	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY48250036	2020/11/24	12
AT	STM-G11	204923	Terminator	Weinschel - API Technologies Corp	M1459A	110101	2021/02/09	12
AT	STS-05	146212	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997828	2021/09/14	12
AT,RE	SOS-23	191840	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
AT,RE	STS-03	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2021/09/14	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	2021/04/27	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2021/05/21	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2021/02/10	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2021/02/08	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2021/03/01	12
RE	SAT10-05	145136	Attenuator	Keysight Technologies Inc	8493C-010	74864	2021/10/07	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2021/02/10	12
RE	SBA-03	145023	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032666	2021/05/15	12
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2021/04/12	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2021/03/01	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2021/01/19	12
RE	SCC-G43	156380	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	SN MY 13406/4E	2021/05/17	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2021/05/18	12
RE	SCC-G58	183047	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800287/4A	2021/05/17	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2021/10/07	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-739	2021/06/14	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2021/06/14	12

Test Equipment [2/2]

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SHA-10	194685	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	711	2021/03/03	12
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	196	2021/05/15	12
RE	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2021/04/13	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2020/12/02	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