RADIO TEST REPORT

Test Report No. 14282658M-A

Customer	**ALPS ALPINE CO., LTD.**
Description of EUT	**Display Control Unit**
Model Number of EUT	**IDCM**
FCC ID	**A269ZUA167**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**October 24, 2022**
Remarks	**-**

Representative Test Engineer	Approved By
Hiromitsu Tanabe Engineer	Kazuhiro Ando Engineer

CERTIFICATE 1266.01

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

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

REVISION HISTORY

Original Test Report No.: 14282658M-A

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14282658M-A	October 24, 2022	-

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	ICES	Interference-Causing Equipment Standard
AC	Alternating Current	IEC	International Electrotechnical Commission
AFH	Adaptive Frequency Hopping	IEEE	Institute of Electrical and Electronics Engineers
AM	Amplitude Modulation	IF	Intermediate Frequency
Amp, AMP	Amplifier	ILAC	International Laboratory Accreditation Conference
ANSI	American National Standards Institute	ISED	Innovation, Science and Economic Development Canada
Ant, ANT	Antenna	ISO	International Organization for Standardization
AP	Access Point	JAB	Japan Accreditation Board
ASK	Amplitude Shift Keying	LAN	Local Area Network
Atten., ATT	Attenuator	LIMS	Laboratory Information Management System
AV	Average	MCS	Modulation and Coding Scheme
BPSK	Binary Phase-Shift Keying	MRA	Mutual Recognition Arrangement
BR	Bluetooth Basic Rate	N/A	Not Applicable
BT	Bluetooth	NIST	National Institute of Standards and Technology
BT LE	Bluetooth Low Energy	NS	No signal detect.
BW	BandWidth	NSA	Normalized Site Attenuation
Cal Int	Calibration Interval	NVLAP	National Voluntary Laboratory Accreditation Program
CCK	Complementary Code Keying	OBW	Occupied Band Width
Ch., CH	Channel	OFDM	Orthogonal Frequency Division Multiplexing
CISPR	Comite International Special des Perturbations Radioelectriques	P/M	Power meter
CW	Continuous Wave	PCB	Printed Circuit Board
DBPSK	Differential BPSK	PER	Packet Error Rate
DC	Direct Current	PHY	Physical Layer
D-factor	Distance factor	PK	Peak
DFS	Dynamic Frequency Selection	PN	Pseudo random Noise
DQPSK	Differential QPSK	PRBS	Pseudo-Random Bit Sequence
DSSS	Direct Sequence Spread Spectrum	PSD	Power Spectral Density
EDR	Enhanced Data Rate	QAM	Quadrature Amplitude Modulation
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	QP	Quasi-Peak
EMC	ElectroMagnetic Compatibility	QPSK	Quadri-Phase Shift Keying
EMI	ElectroMagnetic Interference	RBW	Resolution Band Width
EN	European Norm	RDS	Radio Data System
ERP, e.r.p.	Effective Radiated Power	RE	Radio Equipment
EU	European Union	RF	Radio Frequency
EUT	Equipment Under Test	RMS	Root Mean Square
Fac.	Factor	RSS	Radio Standards Specifications
FCC	Federal Communications Commission	Rx	Receiving
FHSS	Frequency Hopping Spread Spectrum	SA, S/A	Spectrum Analyzer
FM	Frequency Modulation	SG	Signal Generator
Freq.	Frequency	SVSWR	Site-Voltage Standing Wave Ratio
FSK	Frequency Shift Keying	TR	Test Receiver
GFSK	Gaussian Frequency-Shift Keying	Tx	Transmitting
GNSS	Global Navigation Satellite System	VBW	Video BandWidth
GPS	Global Positioning System	Vert.	Vertical
Hori.	Horizontal	WLAN	Wireless LAN

CONTENTS **PAGE**

SECTION 1: Customer Information

Company Name	ALPS ALPINE CO., LTD.
Address	20-1 Yoshima Industrial park, Iwaki, Fukushima, 970-1192 Japan
Telephone Number	+81-246-36-4111
Contact Person	Nobuyuki Ohmi

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	Display Control Unit
Model Number	IDCM
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	April 18, 2022
Test Date	April 19 to May 12, 2022

2.2 Product Description

General Specification

Rating	DC 13.5 V Typ. (DC 9 V to DC 16 V)
Operating temperature	-40 deg. C to +85 deg. C

Radio Specification

Bluetooth (BR / EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, π/4 DQPSK, 8 DPSK)
Antenna Gain	5.2 dBi

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
Title	FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	-	N/A	*1)
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
Carrier Frequency Separation	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)	See data.	Complied a)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (b)			
20dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)		Complied a)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Dwell time	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied c)	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(b)(1)		Complied d)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	2.4 dB 375.011 MHz, QP, Horizontal	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 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)
b) Refer to APPENDIX 1 (data of Number of Hopping Frequency)
c) Refer to APPENDIX 1 (data of Dwell time)
d) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

FCC Part 15.31 (e)

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

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to Standard

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
99% Occupied Bandwidth	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 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.

Radiated emission

Measurement distance	Frequency range	Required Uncertainty (+/-)	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	Not Defined	2.9 dB
	30 MHz to 200 MHz	6.3 dB	6.1 dB
	200 MHz to 1000 MHz		6.2 dB
	1 GHz to 6 GHz	5.2 dB	5.0 dB
	6 GHz to 18 GHz	5.5 dB	5.4 dB
	18 GHz to 40 GHz	Not Defined	5.5 dB
1 m	1 GHz to 18 GHz	Not Defined	5.4 dB
	18 GHz to 40 GHz		5.6 dB
0.5 m	26.5 GHz to 40 GHz	Not Defined	5.9 dB

Antenna Terminal test

Test Item	Required Uncertainty (+/-)	Uncertainty (+/-)
6 dB Bandwidth / 99 % Occupied Bandwidth	Not Defined	1.6 %
Maximum Output Power	0.75 dB	0.73 dB
Burst Rate	Not Defined	0.256 %
Power Density	4 dB	2.2 dB
Conducted Spurious Emission (9 kHz to 30 MHz)	4 dB	2.2 dB

3.5 Test Location

UL Japan, Inc. Kashima EMC Lab.
1614 Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan
Telephone: +81 478 88 6500
A2LA Certificate Number: 1266.01 / FCC Test Firm Registration Number: 910230
ISED Lab Company Number: 4659A / CAB identifier: JP0006

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Open site	6.0 x 5.5 x 2.5	20 x 40	10 m
No.5 Open site	8.6 x 7.1 x 2.4	18 x 23	10 m
No.1 Shielded room	5.4 x 4.5 x 2.3	-	-
No.5 Shielded Room	4.2 x 3.1 x 2.5	-	-
No.9 Shielded Room	6.1 x 3.6 x 2.8	-	-
No.6 Semi-anechoic Chamber	8.5 x 5.5 x 5.2	-	3 m
No.10 Semi-anechoic Chamber	18.4 x 9.9 x 7.7	-	10 m
No.11 Semi-anechoic Chamber	9.0 x 6.5 x 5.2	-	3 m
No.1 Measurement room	5.0 x 3.7 x 2.6	-	-
No.2 Measurement room	4.3 x 4.4 x 2.7	-	-
No.3 Measurement room	4.5 x 5.3 x 2.7	-	-

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: 0 dBm
Software: CSR BlueSuite BlueTest 3 Version 2.5.0.93
(Date: 2022.4.19, Storage location: Driven by connected PC)
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

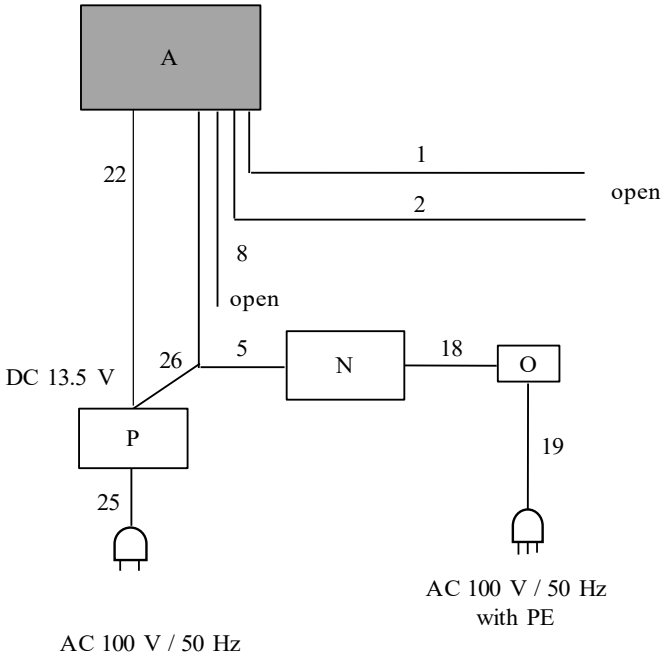
Details of Operating Mode(s)

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

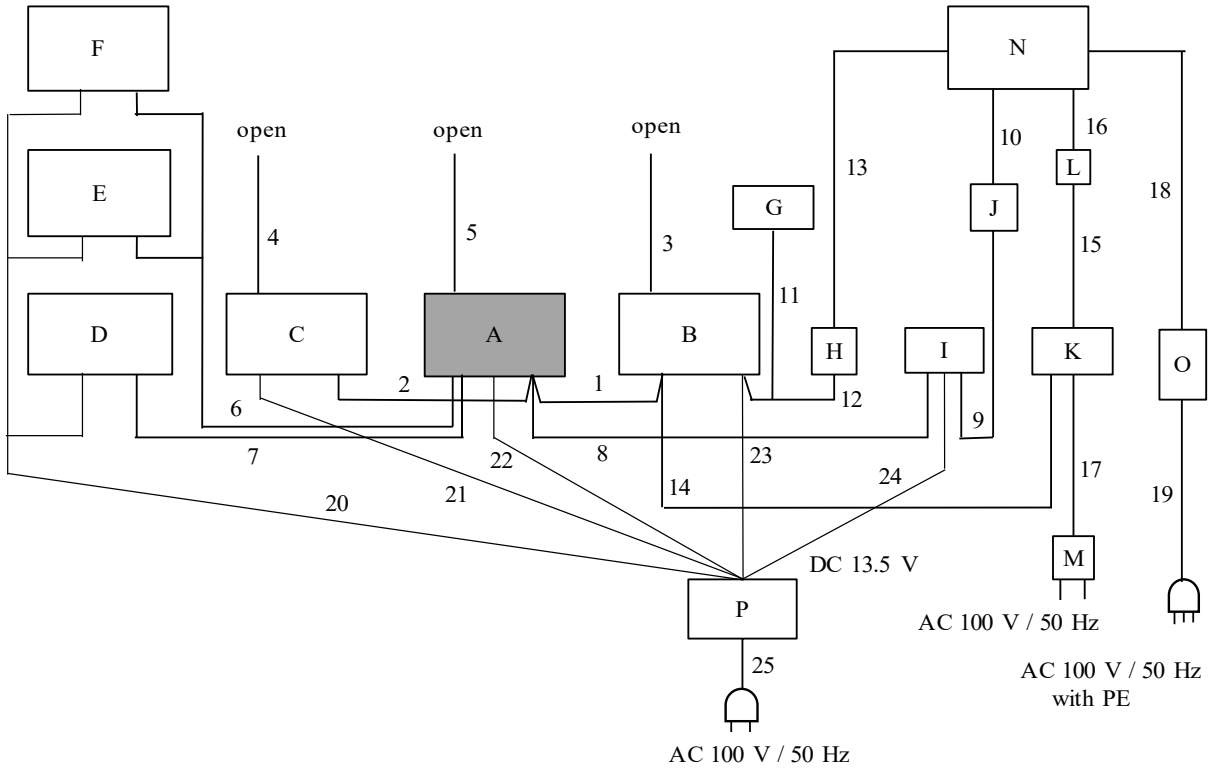
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test).
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.
*It is considered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

4.2 Configuration and Peripherals

Antenna Terminal Conducted



Radiated Emission



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

Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Display Control Unit	IDCM	L122075ZAB10007Q *1) L122075ZAB10008Q *2)	ALPS ALPINE CO., LTD.	EUT
B	Display Control Unit	CSM	L122076ZAC10001Q	ALPS ALPINE CO., LTD.	-
C	Display Control Unit	IDCM-S	-	ALPS ALPINE CO., LTD.	-
D	Display Unit	DJ126NA-01B	0104	ALPS ALPINE CO., LTD.	-
E	Display Unit	DJ126NA-01B	0096	ALPS ALPINE CO., LTD.	-
F	Display Unit	DJ126NA-01B	0098	ALPS ALPINE CO., LTD.	-
G	Dummy Load	-	-	PIGEON	4Ω x4
H	USB - CAN Interface	IPEH-002022-265589	-	PEAK System	-
I	Media Converter Board	RTL9010AA	C018060309	REALTEK	-
J	LAN Adapter	LUA4-U3-AGTE-NBK	20524703209453	BUFFALO	-
K	A2B Board	EVAL-AD2428WD2DZ	-	Analog Device	-
L	A2B Board	EVAL-ADUSB2Z	2018092132519	Analog Device	-
M	AC Adapter	SMI18-12	-	CUI Inc.	-
N	Laptop PC	Vostro 3590	2474696559	Dell	-
O	AC Adapter	HA45NM140	CN-00285K-CH200-03H-0MGU-A07	Dell	-
P	DC Power Supply	GSV3000	1708192899	DIAMOND ANTENNA	-

*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	A2B BUS Cable	2.50	Unshielded	Unshielded	-
2	A2B BUS Cable	2.50	Unshielded	Unshielded	-
3	A2B BUS Cable	1.00	Unshielded	Unshielded	-
4	A2B BUS Cable	1.00	Unshielded	Unshielded	-
5	BT UART Cable	1.00	Unshielded	Unshielded	-
6	LVDS Cable	4.50	Shielded	Shielded	-
7	LVDS Cable	4.80	Shielded	Shielded	-
8	Ethernet Cable	1.50	Unshielded	Unshielded	-
9	LAN Cable	0.30	Unshielded	Unshielded	-
10	USB Cable	0.15	Shielded	Shielded	-
11	Speaker Cable	1.60	Unshielded	Unshielded	-
12	CAN BUS Cable	1.85	Unshielded	Unshielded	-
13	USB Cable	0.25	Shielded	Shielded	-
14	A2B BUS Cable	1.50	Unshielded	Unshielded	-
15	Signal Cable	0.15	Unshielded	Unshielded	-
16	USB Cable	3.00	Shielded	Shielded	-
17	DC Cable	1.50	Unshielded	Unshielded	-
18	DC Cable	1.80	Unshielded	Unshielded	-
19	AC Cable	0.90	Unshielded	Unshielded	-
20	DC Cable	2.40	Unshielded	Unshielded	-
21	DC Cable	3.10	Unshielded	Unshielded	-
22	DC Cable	3.10	Unshielded	Unshielded	-
23	DC Cable	4.60	Unshielded	Unshielded	-
24	DC Cable	1.90	Unshielded	Unshielded	-
25	AC Cable	1.80	Unshielded	Unshielded	-
26	GND Cable	1.50	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

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

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	Below 1 GHz	Above 1 GHz
Antenna Type	Hybrid	Horn

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

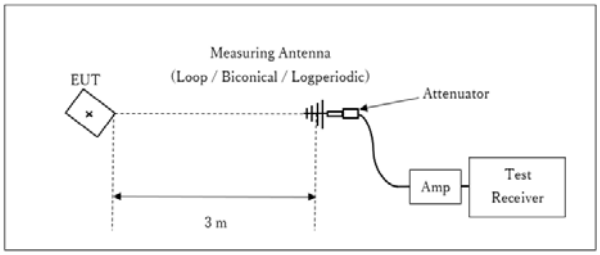
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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

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

Figure 2: Test Setup

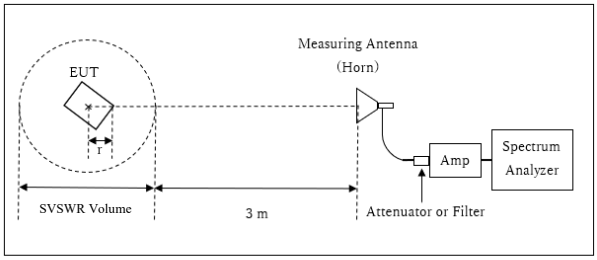
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

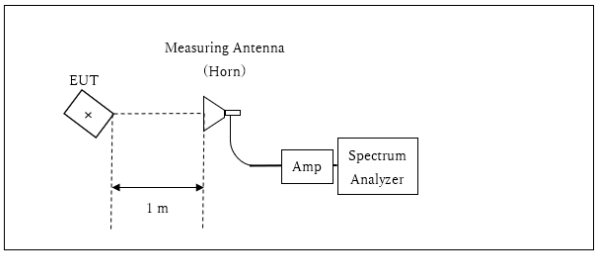


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.88 m / 3.0 m) = 2.23 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.88 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.12 m

10 GHz to 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

The test was made on EUT as tabletop equipment since it was ceiling-mounted device.

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	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz -150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 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

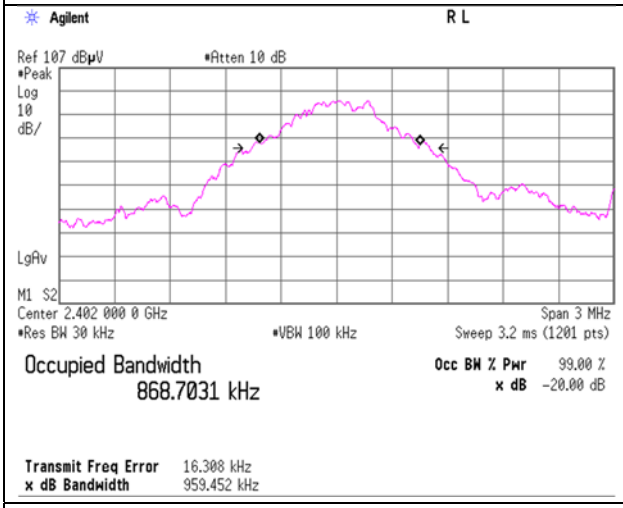
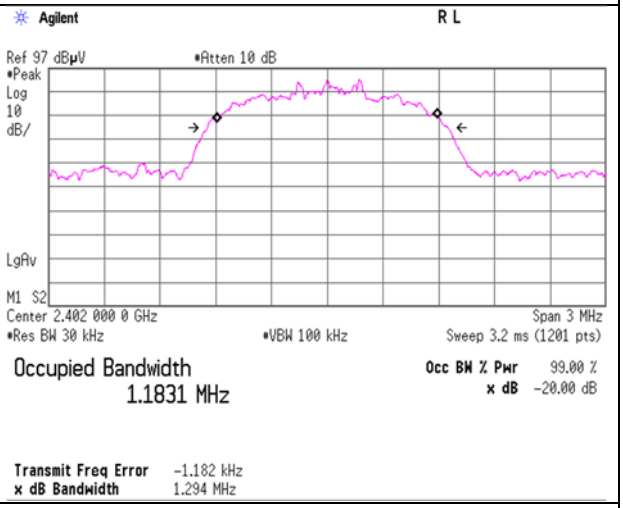
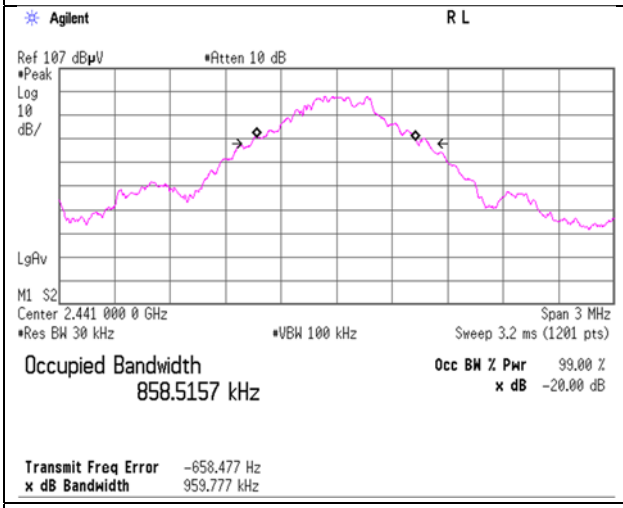
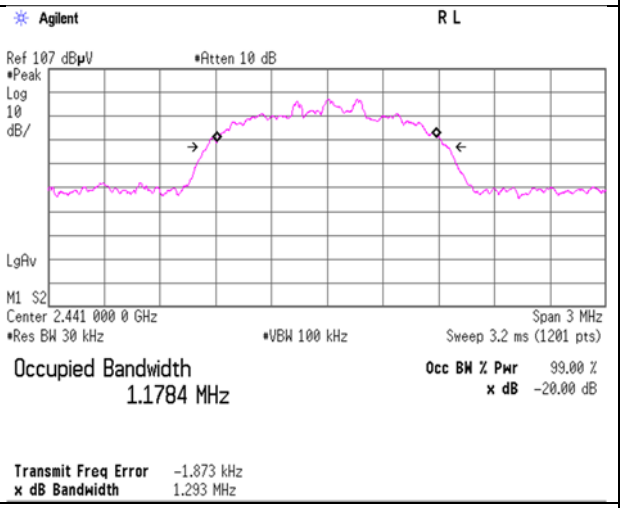
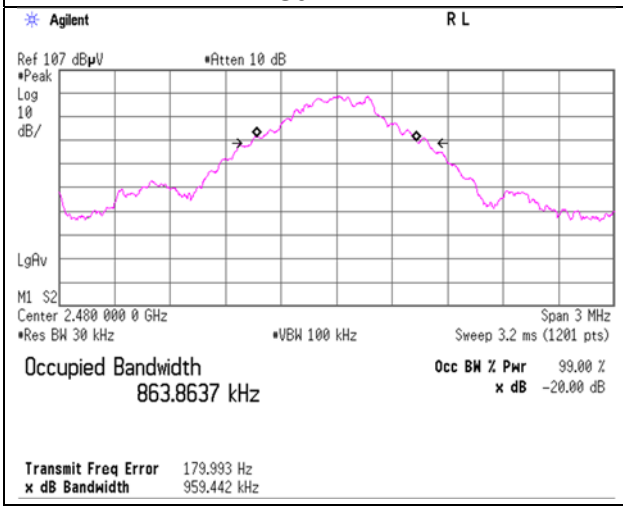
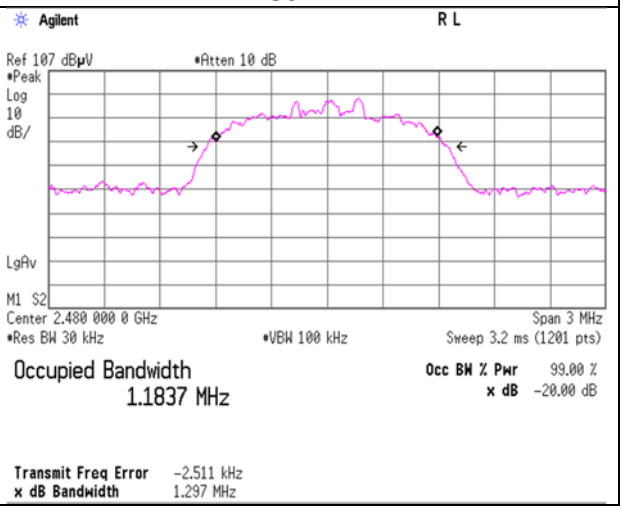
20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation

Test place	Kashima EMC Lab. No.2 Measurement Room	
Date	April 19, 2022	April 21, 2022
Temperature / Humidity	20 deg. C / 55 % RH	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe
Mode	Tx, Hopping Off, Tx, Hopping On	

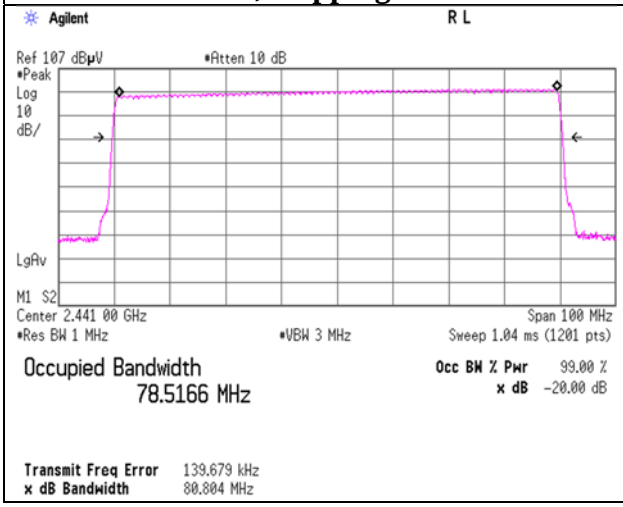
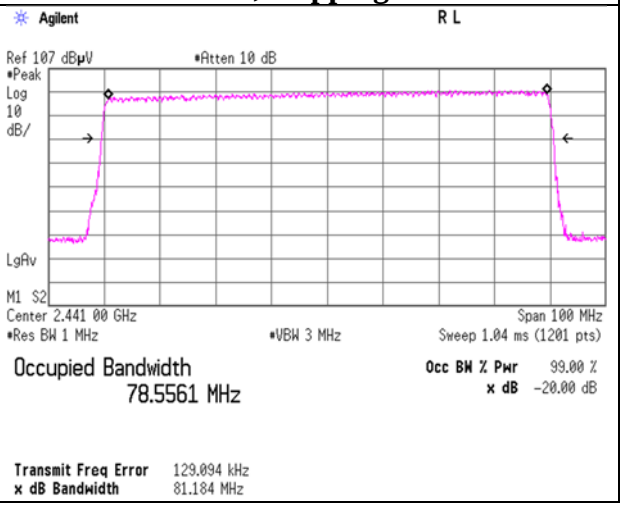
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.959	868.703	1.000	>= 0.640
DH5	2441.0	0.960	858.516	1.000	>= 0.640
DH5	2480.0	0.959	863.864	1.000	>= 0.640
DH5	Hopping On	-	78516.6	-	-
3DH5	2402.0	1.294	1183.098	1.000	>= 0.863
3DH5	2441.0	1.293	1178.418	1.000	>= 0.862
3DH5	2480.0	1.297	1183.650	1.000	>= 0.864
3DH5	Hopping On	-	78556.1	-	-

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

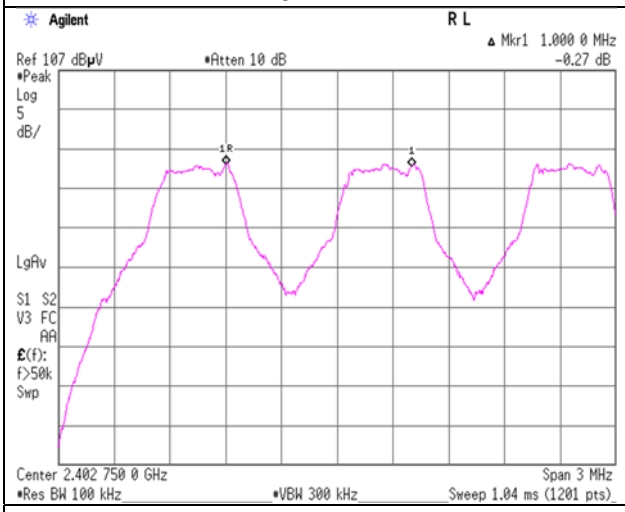
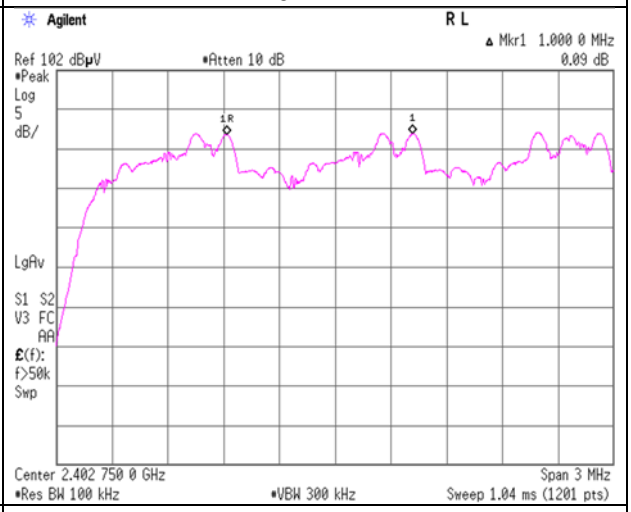
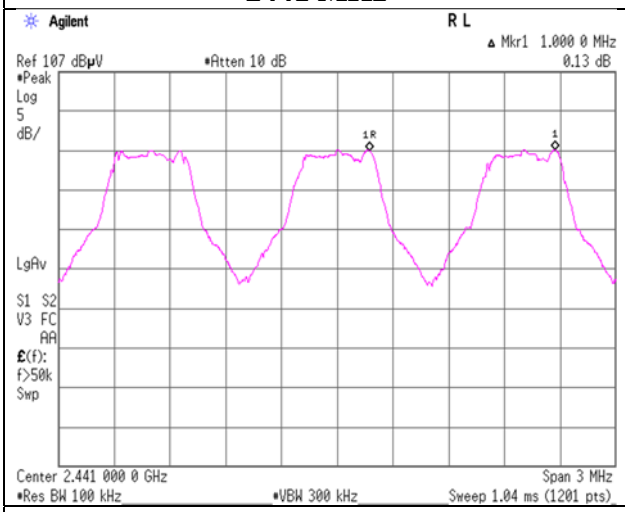
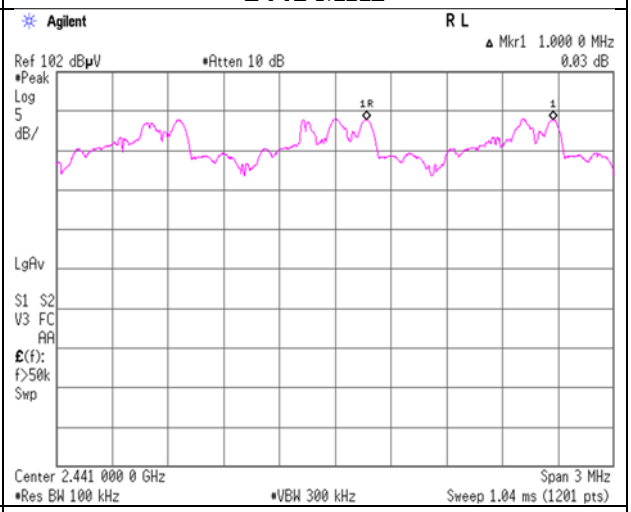
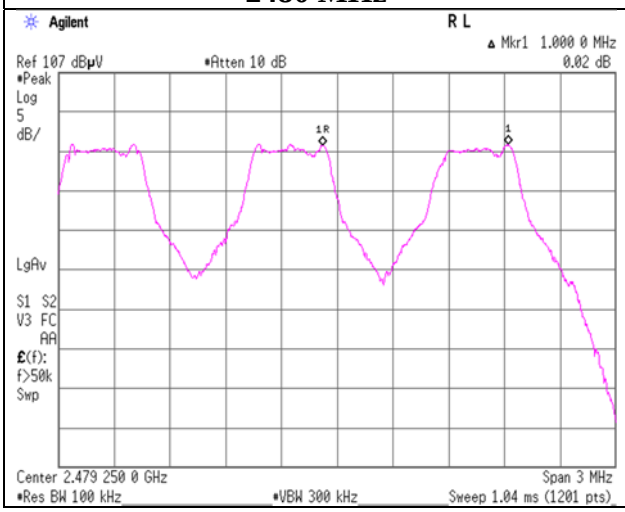
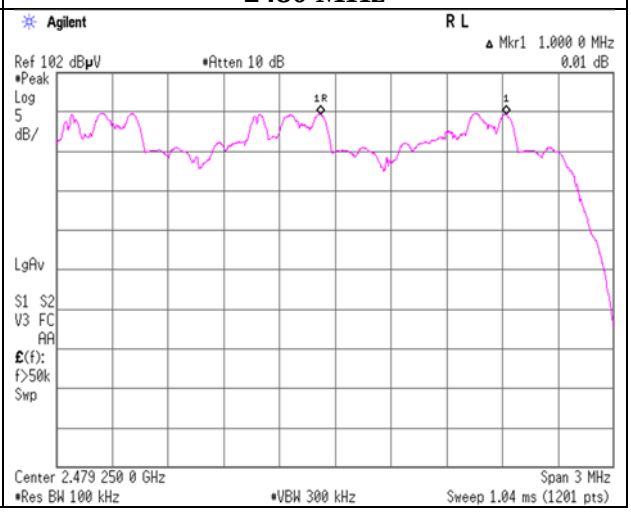
20dB Bandwidth and 99% Occupied Bandwidth

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

20dB Bandwidth and 99% Occupied Bandwidth

DH5, Hopping On	3DH5, Hopping On
	

Carrier Frequency Separation

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

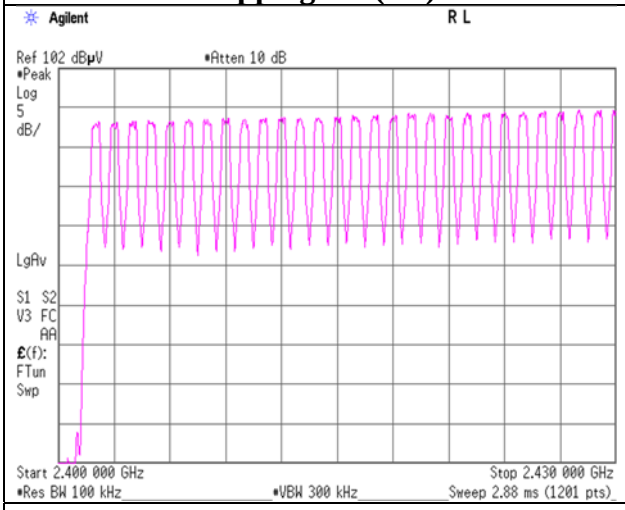
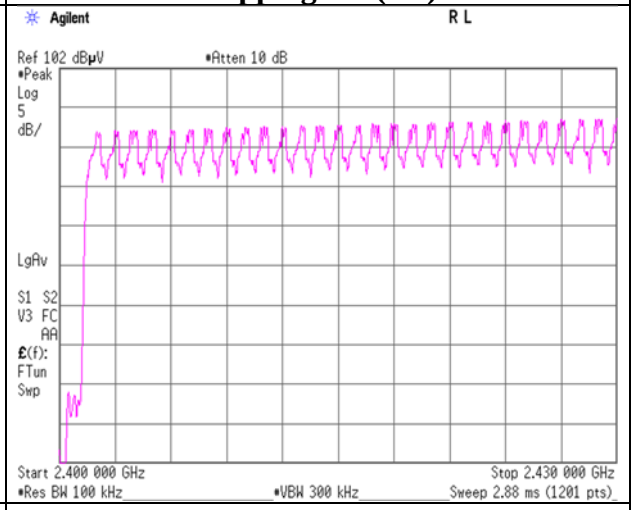
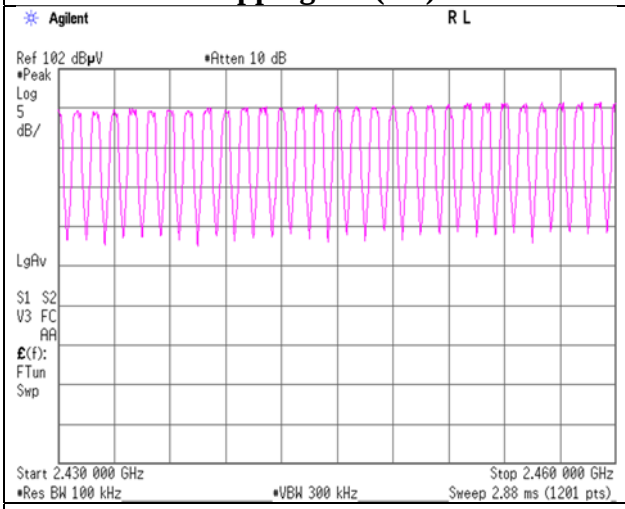
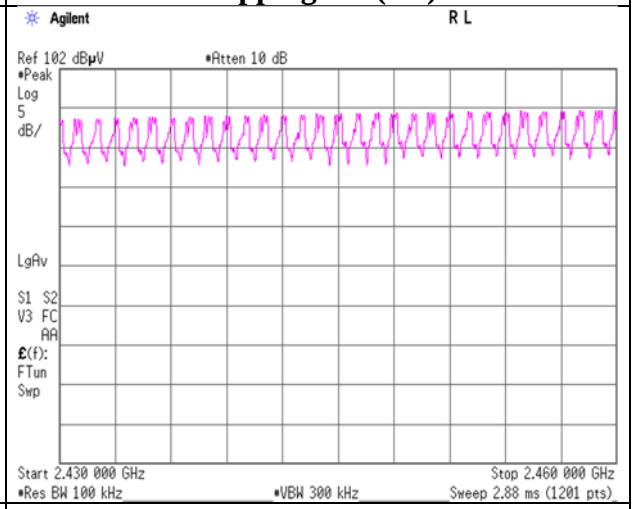
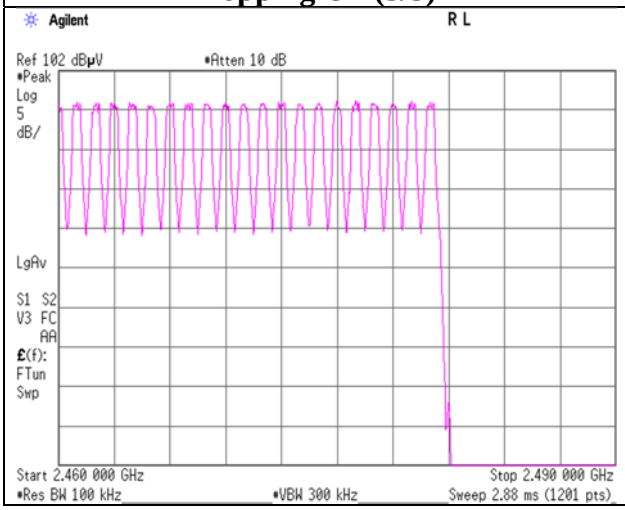
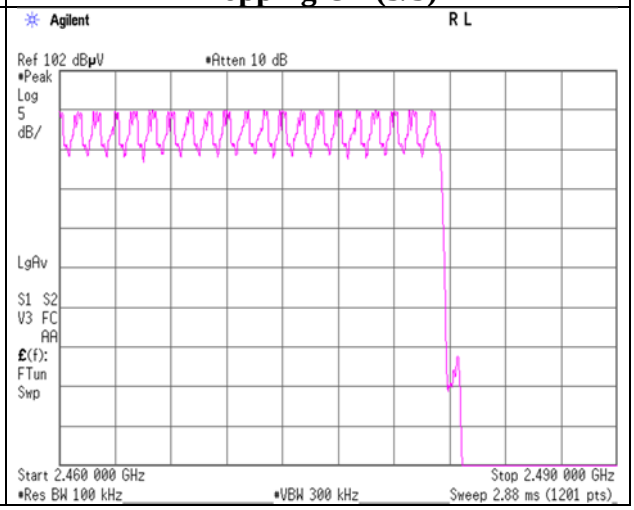
Number of Hopping Frequency

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
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	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4)						Length of transmission [ms]	Result [ms]	Limit [ms]
DH1	51.0 times	/	5 s	x	31.6 s	= 323 times	0.423	137	400
DH3	26.0 times	/	5 s	x	31.6 s	= 165 times	1.679	277	400
DH5	17.0 times	/	5 s	x	31.6 s	= 108 times	2.929	316	400
3DH1	51.0 times	/	5 s	x	31.6 s	= 323 times	0.445	144	400
3DH3	26.0 times	/	5 s	x	31.6 s	= 165 times	1.690	279	400
3DH5	17.0 times	/	5 s	x	31.6 s	= 108 times	2.945	318	400

Sample Calculation
Result = Number of transmission x Length of transmission

*Average data of 5 tests.

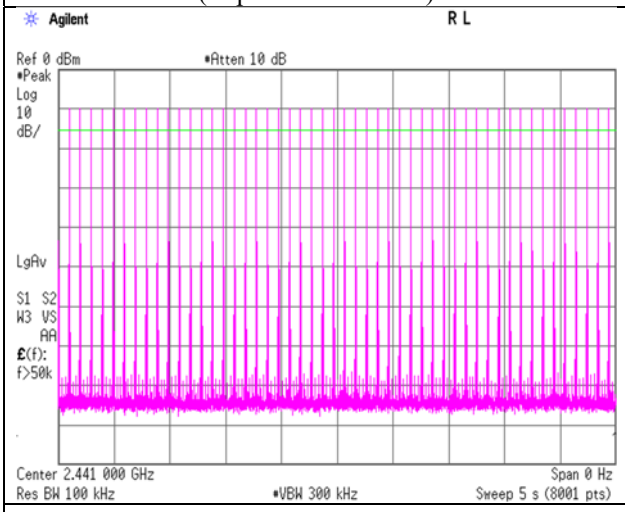
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	51	51	51	51	51
DH3	26	26	26	26	26	26
DH5	17	17	17	17	17	17
3DH1	51	51	51	51	51	51
3DH3	26	26	26	26	26	26
3DH5	17	17	17	17	17	17

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

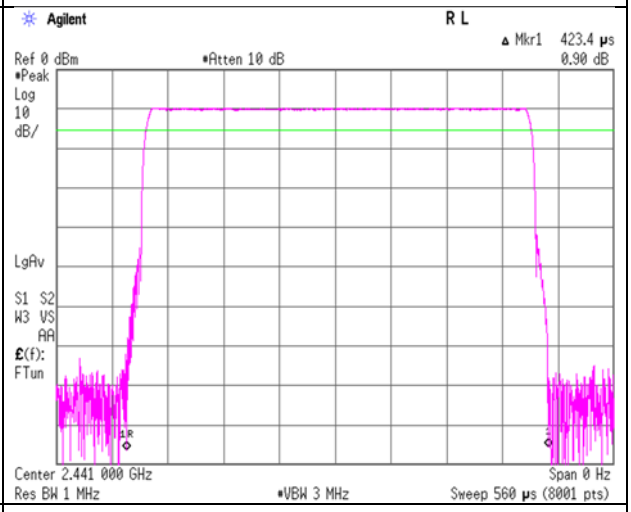
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4 s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4 s regardless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

Dwell time

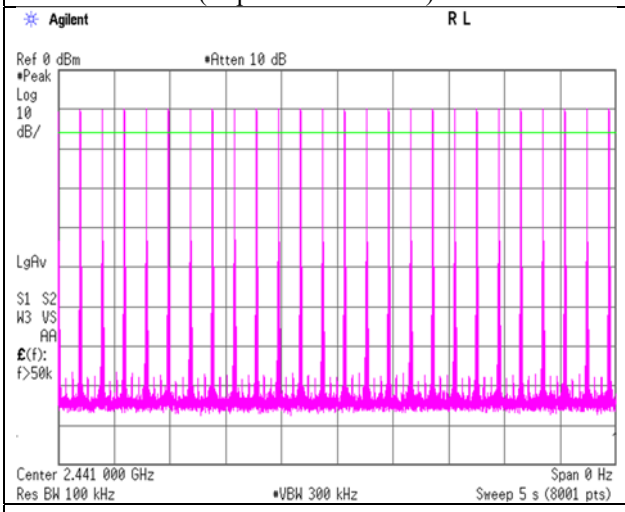
DH1 (1/2)
(Representative chart)



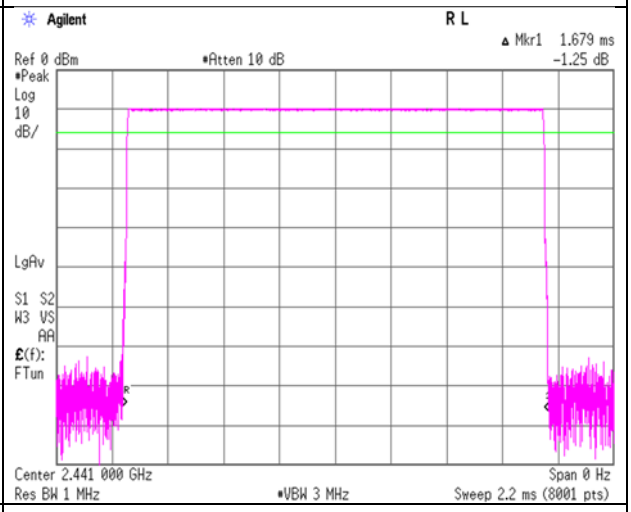
DH1 (2/2)



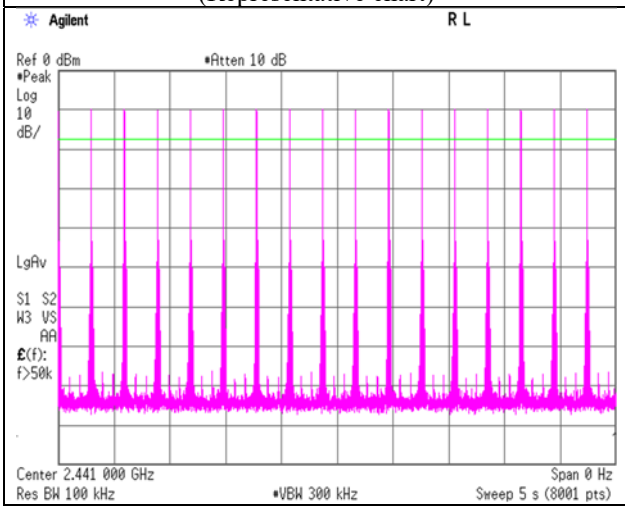
DH3 (1/2)
(Representative chart)



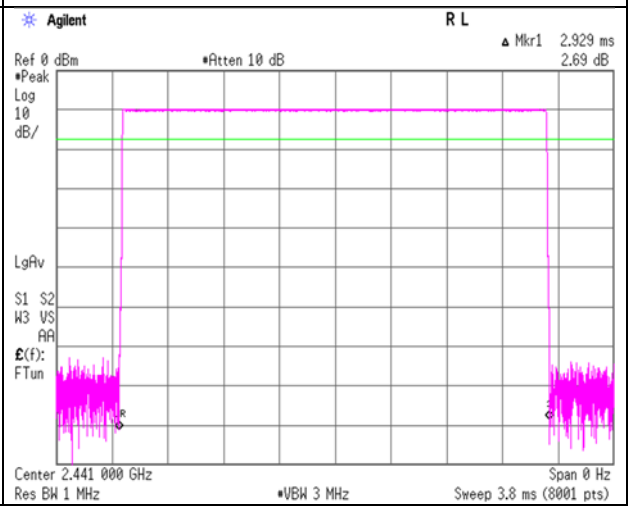
DH3 (2/2)



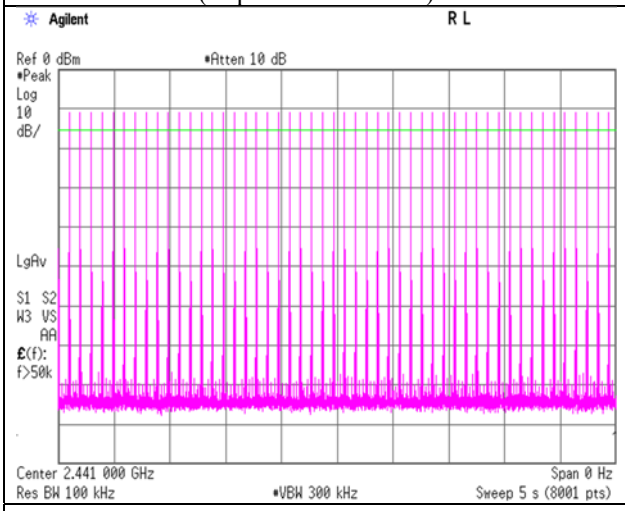
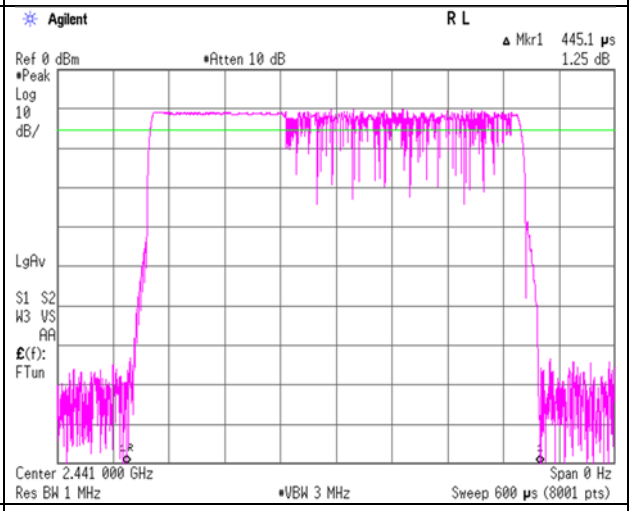
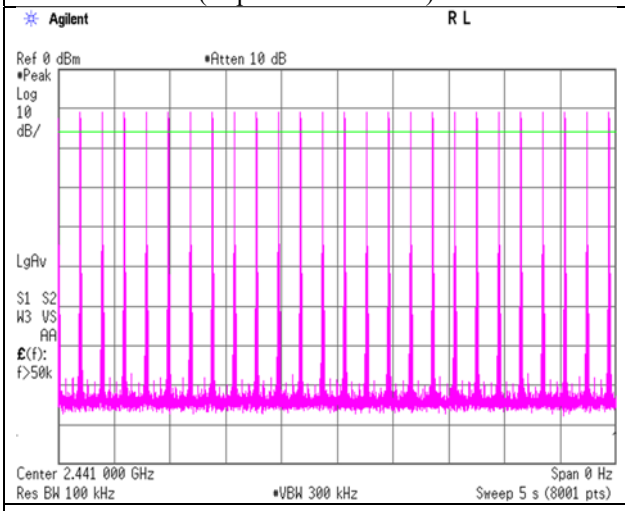
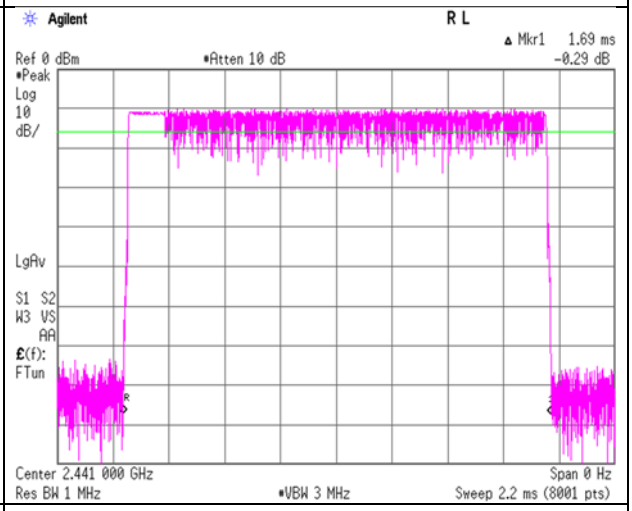
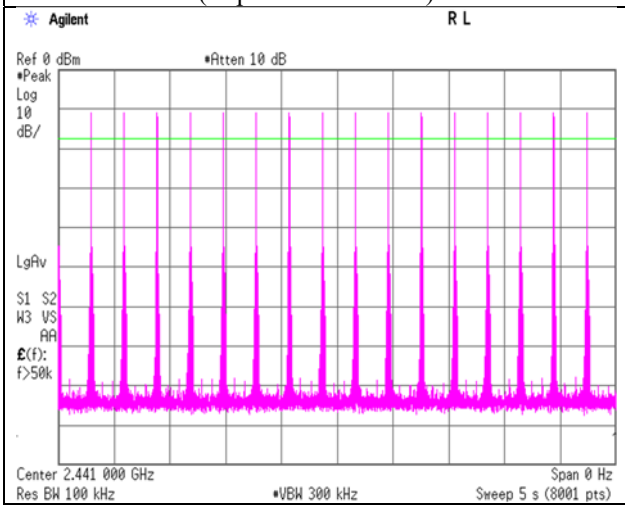
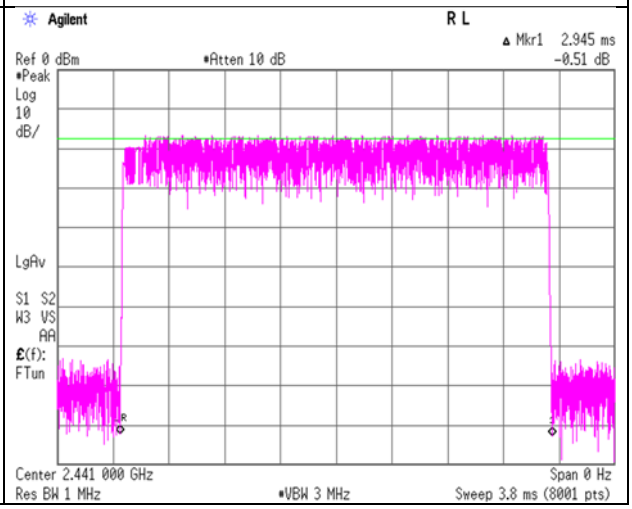
DH5 (1/2)
(Representative chart)



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	Kashima EMC Lab. No.2 Measurement Room
Date	April 19, 2022
Temperature / Humidity	20 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe
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	-11.16	1.27	9.89	0.00	1.00	20.96	125	20.96	5.2	5.20	3.31	36.02	4000	30.82
DH5	2441.0	-9.27	1.28	9.89	1.90	1.55	20.96	125	19.06	5.2	7.10	5.13	36.02	4000	28.92
DH5	2480.0	-8.59	1.30	9.89	2.60	1.82	20.96	125	18.36	5.2	7.80	6.03	36.02	4000	28.22
2DH5	2402.0	-11.52	1.27	9.89	-0.36	0.92	20.96	125	21.32	5.2	4.84	3.05	36.02	4000	31.18
2DH5	2441.0	-9.58	1.28	9.89	1.59	1.44	20.96	125	19.37	5.2	6.79	4.78	36.02	4000	29.23
2DH5	2480.0	-8.88	1.30	9.89	2.31	1.70	20.96	125	18.65	5.2	7.51	5.64	36.02	4000	28.51
3DH5	2402.0	-11.16	1.27	9.89	0.00	1.00	20.96	125	20.96	5.2	5.20	3.31	36.02	4000	30.82
3DH5	2441.0	-9.27	1.28	9.89	1.90	1.55	20.96	125	19.06	5.2	7.10	5.13	36.02	4000	28.92
3DH5	2480.0	-8.59	1.30	9.89	2.60	1.82	20.96	125	18.36	5.2	7.80	6.03	36.02	4000	28.22

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.
However, the limit level 125 mW of AFH mode was used for the test.

Average Output Power
(Reference data for RF Exposure)

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 19, 2022
Temperature / Humidity	20 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe
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	-13.01	1.27	9.89	-1.85	0.65	1.08	-0.77	0.84
DH5	2441.0	-10.90	1.28	9.89	0.27	1.06	1.08	1.35	1.36
DH5	2480.0	-10.17	1.30	9.89	1.02	1.26	1.08	2.10	1.62
2DH5	2402.0	-15.14	1.27	9.89	-3.98	0.40	1.06	-2.92	0.51
2DH5	2441.0	-12.97	1.28	9.89	-1.80	0.66	1.06	-0.74	0.84
2DH5	2480.0	-12.19	1.30	9.89	-1.00	0.79	1.06	0.06	1.01
3DH5	2402.0	-15.16	1.27	9.89	-4.00	0.40	1.06	-2.94	0.51
3DH5	2441.0	-12.98	1.28	9.89	-1.81	0.66	1.06	-0.75	0.84
3DH5	2480.0	-12.19	1.30	9.89	-1.00	0.79	1.06	0.06	1.01

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

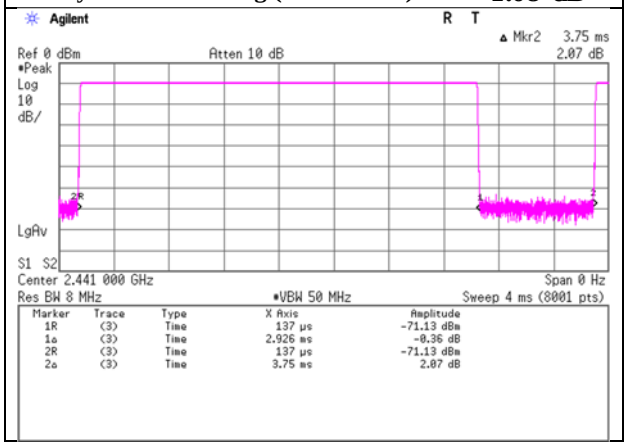
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 19, 2022
Temperature / Humidity	20 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping Off

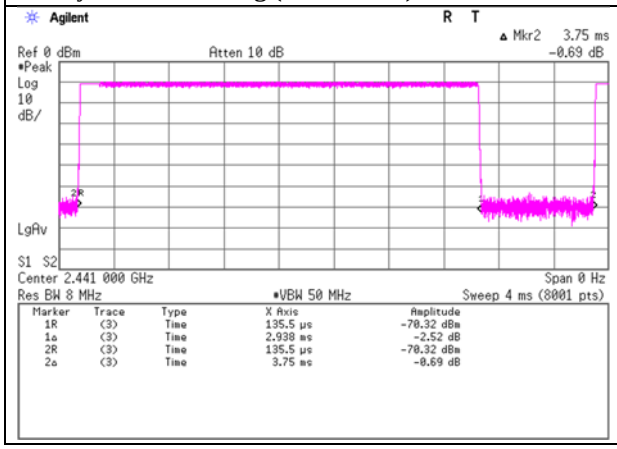
DH5

Tx on / (Tx on + Tx off) =	**0.780**
Tx on / (Tx on + Tx off) * 100 =	**78.0 %**
Duty factor = 10 * log (3.75 / 2.926) =	**1.08 dB**



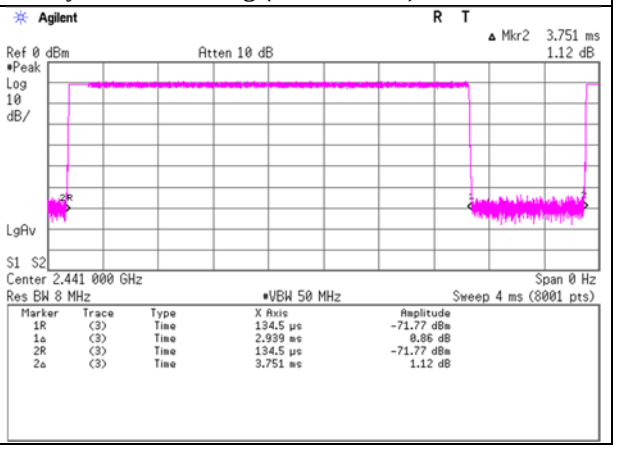
2DH5

Tx on / (Tx on + Tx off) =	**0.783**
Tx on / (Tx on + Tx off) * 100 =	**78.3 %**
Duty factor = 10 * log (3.75 / 2.938) =	**1.06 dB**



3DH5

Tx on / (Tx on + Tx off) =	**0.784**
Tx on / (Tx on + Tx off) * 100 =	**78.4 %**
Duty factor = 10 * log (3.751 / 2.939) =	**1.06 dB**



Radiated Spurious Emission

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	May 12, 2022	May 9, 2022	May 9, 2022	May 12, 2022
Temperature / Humidity	19 deg. C / 55 % RH	21 deg. C / 47 % RH	21 deg. C / 47 % RH	19 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(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.	55.727	QP	36.30	13.48	5.96	32.20	0.00	23.54	40.0	16.4	400	72	
Hori.	160.038	QP	43.30	13.42	6.79	32.11	0.00	31.40	43.5	12.1	238	327	
Hori.	250.007	QP	46.70	11.72	7.34	32.04	0.00	33.72	46.0	12.2	100	27	
Hori.	375.005	QP	52.40	15.14	7.94	31.98	0.00	43.50	46.0	**2.5**	100	189	
Hori.	500.013	QP	40.00	17.77	8.45	32.00	0.00	34.22	46.0	11.7	100	194	
Hori.	750.040	QP	36.10	21.99	9.35	31.98	0.00	35.46	46.0	10.5	100	238	
Hori.	2390.000	PK	53.70	27.58	13.43	46.21	2.23	50.73	73.9	23.1	207	227	
Hori.	2558.015	PK	56.70	28.22	13.57	46.01	2.23	54.71	73.9	19.1	209	281	
Hori.	2587.210	PK	58.70	28.39	13.59	45.96	2.23	56.95	73.9	16.9	149	157	
Hori.	4804.000	PK	54.30	32.49	5.49	45.74	2.23	48.77	73.9	25.1	150	0	Floor noise
Hori.	6000.575	PK	58.10	34.90	6.14	45.45	2.23	55.92	73.9	17.9	210	125	
Hori.	7206.000	PK	51.60	37.06	6.72	44.87	2.23	52.74	73.9	21.1	150	0	Floor noise
Hori.	9608.000	PK	49.10	37.96	7.51	43.24	2.23	53.56	73.9	20.3	150	0	Floor noise
Hori.	2390.000	AV	42.20	27.58	13.43	46.21	2.23	39.23	53.9	14.6	207	227	VBW: 360 Hz
Hori.	2558.015	AV	48.50	28.22	13.57	46.01	2.23	46.51	53.9	7.3	209	281	VBW: 360 Hz*1)
Hori.	2587.210	AV	47.10	28.39	13.59	45.96	2.23	45.35	53.9	8.5	149	157	VBW: 10 Hz
Hori.	4804.000	AV	41.80	32.49	5.49	45.74	2.23	36.27	53.9	17.6	150	0	Floor noise
Hori.	6000.575	AV	47.30	34.90	6.14	45.45	2.23	45.12	53.9	8.7	210	125	VBW: 360 Hz
Hori.	7206.000	AV	38.30	37.06	6.72	44.87	2.23	39.44	53.9	14.4	150	0	Floor noise
Hori.	9608.000	AV	37.00	37.96	7.51	43.24	2.23	41.46	53.9	12.4	150	0	Floor noise
Vert.	42.919	QP	40.00	13.52	5.82	32.21	0.00	27.13	40.0	12.8	100	300	
Vert.	250.005	QP	46.00	11.72	7.34	32.04	0.00	33.02	46.0	12.9	173	171	
Vert.	375.011	QP	43.00	15.14	7.94	31.98	0.00	34.10	46.0	11.9	149	190	
Vert.	2390.000	PK	54.10	27.58	13.43	46.21	2.23	51.13	73.9	22.7	151	149	
Vert.	2506.300	PK	59.30	28.06	13.52	46.09	2.23	57.02	73.9	16.8	147	167	
Vert.	2558.015	PK	56.30	28.22	13.57	46.01	2.23	54.31	73.9	19.5	151	146	
Vert.	4804.000	PK	54.30	32.49	5.49	45.74	2.23	48.77	73.9	25.1	150	0	Floor noise
Vert.	6000.575	PK	57.70	34.90	6.14	45.45	2.23	55.52	73.9	18.3	175	200	
Vert.	7206.000	PK	50.60	37.06	6.72	44.87	2.23	51.74	73.9	22.1	150	0	Floor noise
Vert.	9608.000	PK	49.10	37.96	7.51	43.24	2.23	53.56	73.9	20.3	150	0	Floor noise
Vert.	2390.000	AV	42.10	27.58	13.43	46.21	2.23	39.13	53.9	14.7	151	149	VBW: 360 Hz
Vert.	2506.300	AV	48.00	28.06	13.52	46.09	2.23	45.72	53.9	8.1	147	167	VBW: 10 Hz
Vert.	2558.015	AV	46.60	28.22	13.57	46.01	2.23	44.61	53.9	9.2	151	146	VBW: 360 Hz*1)
Vert.	4804.000	AV	41.90	32.49	5.49	45.74	2.23	36.37	53.9	17.5	150	0	Floor noise
Vert.	6000.575	AV	49.10	34.90	6.14	45.45	2.23	46.92	53.9	6.9	175	200	VBW: 360 Hz
Vert.	7206.000	AV	38.40	37.06	6.72	44.87	2.23	39.54	53.9	14.3	150	0	Floor noise
Vert.	9608.000	AV	36.90	37.96	7.51	43.24	2.23	41.36	53.9	12.5	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) This noise has the same duty cycle as the carrier.
* These results have sufficient margin without taking account Dwell time factor.

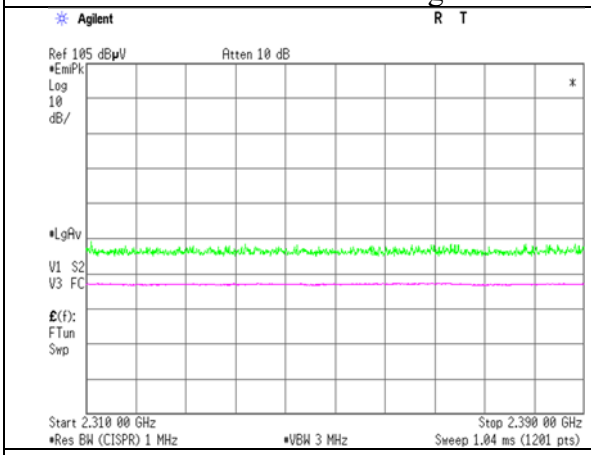
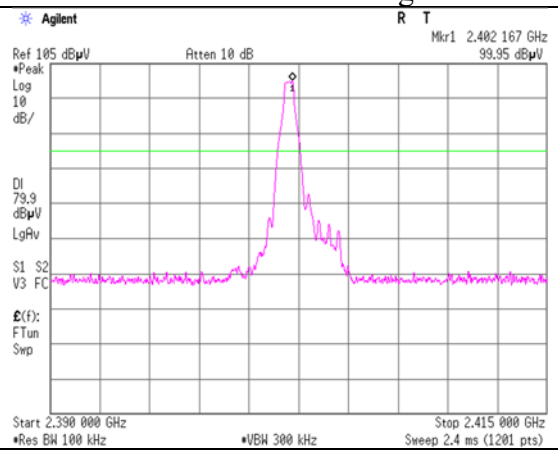
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

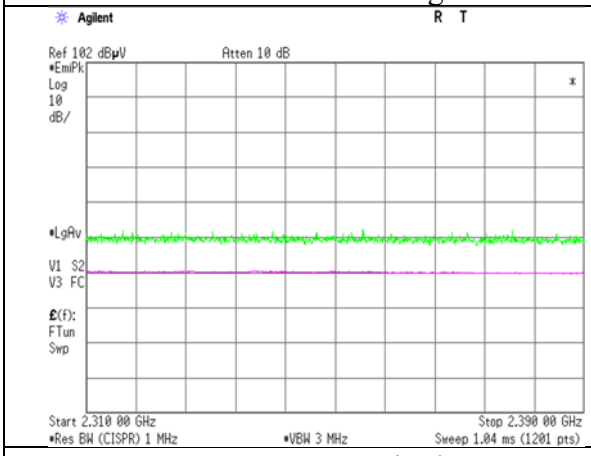
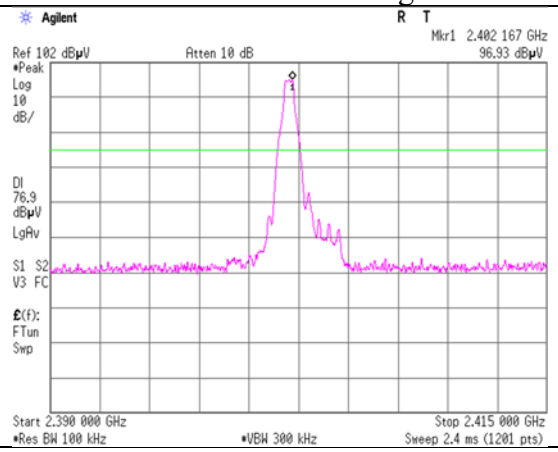
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	99.90	27.61	13.44	46.20	2.23	96.98	-	-	Carrier
Hori.	2400.000	PK	48.90	27.60	13.44	46.20	2.23	45.97	76.98	31.0	
Vert.	2402.000	PK	96.90	27.61	13.44	46.20	2.23	93.98	-	-	Carrier
Vert.	2400.000	PK	46.50	27.60	13.44	46.20	2.23	43.57	73.98	30.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	May 9, 2022
Temperature / Humidity	21 deg. C / 47 % RH
Engineer	Hiromitsu Tanabe
	(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	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	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	May 12, 2022	May 9, 2022	May 9, 2022	May 12, 2022
Temperature / Humidity	19 deg. C / 55 % RH	21 deg. C / 47 % RH	21 deg. C / 47 % RH	19 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(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.	55.770	QP	37.60	13.48	5.96	32.20	0.00	24.84	40.0	15.1	400	55	
Hori.	164.077	QP	45.00	13.19	6.82	32.11	0.00	32.90	43.5	10.6	250	305	
Hori.	250.005	QP	44.10	11.72	7.34	32.04	0.00	31.12	46.0	14.8	150	25	
Hori.	375.011	QP	52.50	15.14	7.94	31.98	0.00	43.60	46.0	**2.4**	100	190	
Hori.	528.000	QP	36.10	18.24	8.56	32.01	0.00	30.89	46.0	15.1	100	190	
Hori.	750.006	QP	36.30	21.99	9.35	31.98	0.00	35.66	46.0	10.3	110	237	
Hori.	2577.745	PK	59.50	28.34	13.58	45.98	2.23	57.67	73.9	16.2	146	157	
Hori.	2597.440	PK	57.10	28.45	13.60	45.94	2.23	55.44	73.9	18.4	156	228	
Hori.	4882.000	PK	53.30	32.54	5.52	45.73	2.23	47.86	73.9	26.0	150	0	
Hori.	6000.575	PK	57.20	34.90	6.14	45.45	2.23	55.02	73.9	18.8	220	130	
Hori.	7323.000	PK	51.10	37.22	6.74	44.69	2.23	52.60	73.9	21.3	150	0	
Hori.	9764.000	PK	49.60	37.94	7.56	43.16	2.23	54.17	73.9	19.7	150	0	
Hori.	2577.745	AV	47.10	28.34	13.58	45.98	2.23	45.27	53.9	8.6	146	157	VBW: 10 Hz
Hori.	2597.440	AV	47.40	28.45	13.60	45.94	2.23	45.74	53.9	8.1	156	228	VBW: 360 Hz*1)
Hori.	4882.000	AV	40.80	32.54	5.52	45.73	2.23	35.36	53.9	18.5	150	0	Floor noise
Hori.	6000.575	AV	47.00	34.90	6.14	45.45	2.23	44.82	53.9	9.0	220	130	VBW: 10 Hz
Hori.	7323.000	AV	38.70	37.22	6.74	44.69	2.23	40.20	53.9	13.7	150	0	Floor noise
Hori.	9764.000	AV	36.90	37.94	7.56	43.16	2.23	41.47	53.9	12.4	150	0	Floor noise
Vert.	42.923	QP	40.30	13.52	5.82	32.21	0.00	27.43	40.0	12.5	100	300	
Vert.	250.005	QP	42.00	11.72	7.34	32.04	0.00	29.02	46.0	16.9	165	155	
Vert.	375.011	QP	42.60	15.14	7.94	31.98	0.00	33.70	46.0	12.3	100	170	
Vert.	2504.783	PK	58.80	28.05	13.52	46.09	2.23	56.51	73.9	17.3	147	167	
Vert.	2597.440	PK	55.70	28.45	13.60	45.94	2.23	54.04	73.9	19.8	153	132	
Vert.	4882.000	PK	52.90	32.54	5.52	45.73	2.23	47.46	73.9	26.4	150	0	
Vert.	6000.575	PK	57.20	34.90	6.14	45.45	2.23	55.02	73.9	18.8	170	200	
Vert.	7323.000	PK	52.40	37.22	6.74	44.69	2.23	53.90	73.9	20.0	150	0	
Vert.	9764.000	PK	50.40	37.94	7.56	43.16	2.23	54.97	73.9	18.9	150	0	
Vert.	2504.783	AV	47.90	28.05	13.52	46.09	2.23	45.61	53.9	8.2	147	167	VBW: 10 Hz
Vert.	2597.440	AV	45.00	28.45	13.60	45.94	2.23	43.34	53.9	10.5	153	132	VBW: 360 Hz*1)
Vert.	4882.000	AV	40.20	32.54	5.52	45.73	2.23	34.76	53.9	19.1	150	0	Floor noise
Vert.	6000.575	AV	48.80	34.90	6.14	45.45	2.23	46.62	53.9	7.2	170	200	VBW: 10 Hz
Vert.	7323.000	AV	38.70	37.22	6.74	44.69	2.23	40.20	53.9	13.7	150	0	Floor noise
Vert.	9764.000	AV	36.70	37.94	7.56	43.16	2.23	41.27	53.9	12.6	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*1) This noise has the same duty cycle as the carrier.

* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	May 12, 2022	May 9, 2022	May 9, 2022	May 12, 2022
Temperature / Humidity	19 deg. C / 55 % RH	21 deg. C / 47 % RH	21 deg. C / 47 % RH	19 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(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.	55.770	QP	37.50	13.48	5.96	32.20	0.00	24.74	40.0	15.2	400	60	
Hori.	164.077	QP	45.70	13.19	6.82	32.11	0.00	33.60	43.5	9.9	240	315	
Hori.	250.005	QP	44.30	11.72	7.34	32.04	0.00	31.32	46.0	14.6	150	40	
Hori.	375.011	QP	51.30	15.14	7.94	31.98	0.00	42.40	46.0	**3.6**	100	190	
Hori.	528.000	QP	40.10	18.24	8.56	32.01	0.00	34.89	46.0	11.1	160	250	
Hori.	750.006	QP	37.60	21.99	9.35	31.98	0.00	36.96	46.0	9.0	110	238	
Hori.	2483.500	PK	54.00	27.94	13.51	46.12	2.23	51.56	73.9	22.3	159	280	
Hori.	2583.840	PK	59.50	28.37	13.59	45.97	2.23	57.72	73.9	16.1	144	153	
Hori.	2636.000	PK	55.20	28.61	13.62	45.88	2.23	53.78	73.9	20.1	165	278	
Hori.	4960.000	PK	51.20	32.66	5.57	45.73	2.23	45.93	73.9	27.9	150	0	
Hori.	6000.575	PK	56.30	34.90	6.14	45.45	2.23	54.12	73.9	19.7	210	125	
Hori.	7440.000	PK	49.80	37.25	6.77	44.64	2.23	51.41	73.9	22.4	150	0	
Hori.	9920.000	PK	47.30	38.14	7.62	43.23	2.23	52.06	73.9	21.8	150	0	
Hori.	2483.500	AV	43.10	27.94	13.51	46.12	2.23	40.66	53.9	13.2	159	280	VBW: 360 Hz
Hori.	2583.840	AV	48.30	28.37	13.59	45.97	2.23	46.52	53.9	7.3	144	153	VBW: 10 Hz
Hori.	2636.000	AV	46.10	28.61	13.62	45.88	2.23	44.68	53.9	9.2	165	278	VBW: 360 Hz*1)
Hori.	4960.000	AV	40.50	32.66	5.57	45.73	2.23	35.23	53.9	18.6	150	0	Floor noise
Hori.	6000.575	AV	47.40	34.90	6.14	45.45	2.23	45.22	53.9	8.6	210	125	VBW: 10 Hz
Hori.	7440.000	AV	39.10	37.25	6.77	44.64	2.23	40.71	53.9	13.1	150	0	Floor noise
Hori.	9920.000	AV	36.20	38.14	7.62	43.23	2.23	40.96	53.9	12.9	150	0	Floor noise
Vert.	42.923	QP	40.10	13.52	5.82	32.21	0.00	27.23	40.0	12.7	100	280	
Vert.	375.011	QP	42.70	15.14	7.94	31.98	0.00	33.80	46.0	12.2	100	160	
Vert.	528.000	QP	35.90	18.24	8.56	32.01	0.00	30.69	46.0	15.3	100	240	
Vert.	2483.500	PK	54.30	27.94	13.51	46.12	2.23	51.86	73.9	22.0	153	134	
Vert.	2503.010	PK	60.40	28.05	13.52	46.10	2.23	58.10	73.9	15.8	134	169	
Vert.	2636.000	PK	54.50	28.61	13.62	45.88	2.23	53.08	73.9	20.8	139	151	
Vert.	4960.000	PK	52.00	32.66	5.57	45.73	2.23	46.73	73.9	27.1	150	0	
Vert.	6000.575	PK	57.20	34.90	6.14	45.45	2.23	55.02	73.9	18.8	150	210	
Vert.	7440.000	PK	50.10	37.25	6.77	44.64	2.23	51.71	73.9	22.1	150	0	
Vert.	9920.000	PK	47.10	38.14	7.62	43.23	2.23	51.86	73.9	22.0	150	0	
Vert.	2483.500	AV	43.00	27.94	13.51	46.12	2.23	40.56	53.9	13.3	153	134	VBW: 360 Hz
Vert.	2503.010	AV	48.30	28.05	13.52	46.10	2.23	46.00	53.9	7.9	134	169	VBW: 10 Hz
Vert.	2636.000	AV	43.60	28.61	13.62	45.88	2.23	42.18	53.9	11.7	139	151	VBW: 360 Hz*1)
Vert.	4960.000	AV	41.30	32.66	5.57	45.73	2.23	36.03	53.9	17.8	150	0	Floor noise
Vert.	6000.575	AV	48.80	34.90	6.14	45.45	2.23	46.62	53.9	7.2	150	210	VBW: 10 Hz
Vert.	7440.000	AV	39.20	37.25	6.77	44.64	2.23	40.81	53.9	13.0	150	0	Floor noise
Vert.	9920.000	AV	36.30	38.14	7.62	43.23	2.23	41.06	53.9	12.8	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB

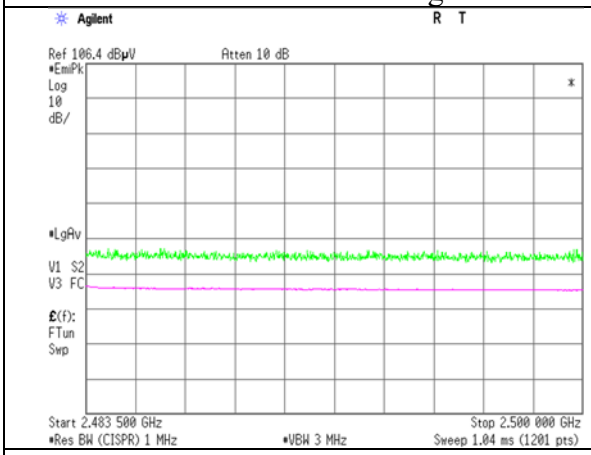
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

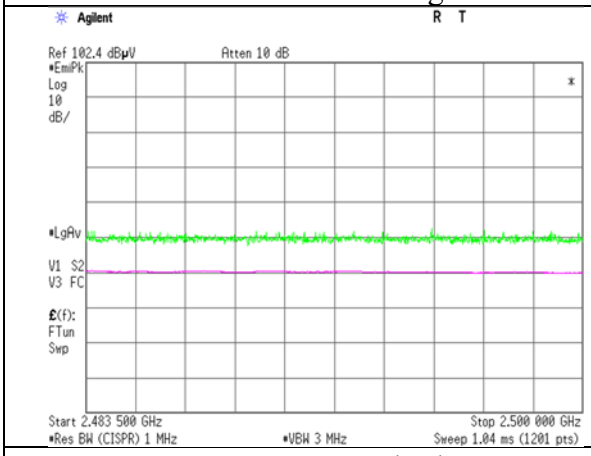
*1) This noise has the same duty cycle as the carrier.

* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	May 9, 2022
Temperature / Humidity	21 deg. C / 47 % RH
Engineer	Hiromitsu Tanabe
	(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	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	May 12, 2022	May 9, 2022	May 9, 2022	May 12, 2022
Temperature / Humidity	19 deg. C / 55 % RH	21 deg. C / 47 % RH	21 deg. C / 47 % RH	19 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(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.	55.770	QP	36.90	13.48	5.96	32.20	0.00	24.14	40.0	15.8	400	65	
Hori.	164.077	QP	45.70	13.19	6.82	32.11	0.00	33.60	43.5	9.9	240	330	
Hori.	250.005	QP	42.50	11.72	7.34	32.04	0.00	29.52	46.0	16.4	150	40	
Hori.	375.011	QP	50.90	15.14	7.94	31.98	0.00	42.00	46.0	**4.0**	100	260	
Hori.	528.000	QP	40.30	18.24	8.56	32.01	0.00	35.09	46.0	10.9	170	250	
Hori.	750.006	QP	37.50	21.99	9.35	31.98	0.00	36.86	46.0	9.1	110	240	
Hori.	2390.000	PK	53.80	27.58	13.43	46.21	2.23	50.83	73.9	23.0	151	274	
Hori.	2558.140	PK	56.40	28.23	13.57	46.01	2.23	54.42	73.9	19.4	148	275	
Hori.	2577.745	PK	59.50	28.34	13.58	45.98	2.23	57.67	73.9	16.2	154	157	
Hori.	4804.000	PK	52.50	32.49	5.49	45.74	2.23	46.97	73.9	26.9	150	0	
Hori.	6000.575	PK	56.60	34.90	6.14	45.45	2.23	54.42	73.9	19.4	210	125	
Hori.	7206.000	PK	50.40	37.06	6.72	44.87	2.23	51.54	73.9	22.3	150	0	
Hori.	9608.000	PK	47.30	37.96	7.51	43.24	2.23	51.76	73.9	22.1	150	0	
Hori.	2390.000	AV	42.30	27.58	13.43	46.21	2.23	39.33	53.9	14.5	151	274	VBW: 360 Hz
Hori.	2558.140	AV	46.50	28.23	13.57	46.01	2.23	44.52	53.9	9.3	148	275	VBW: 360 Hz*1)
Hori.	2577.745	AV	47.40	28.34	13.58	45.98	2.23	45.57	53.9	8.3	154	157	VBW: 10 Hz
Hori.	4804.000	AV	41.60	32.49	5.49	45.74	2.23	36.07	53.9	17.8	150	0	Floor noise
Hori.	6000.575	AV	47.40	34.90	6.14	45.45	2.23	45.22	53.9	8.6	210	125	VBW: 10 Hz
Hori.	7206.000	AV	38.20	37.06	6.72	44.87	2.23	39.34	53.9	14.5	150	0	Floor noise
Hori.	9608.000	AV	36.90	37.96	7.51	43.24	2.23	41.36	53.9	12.5	150	0	Floor noise
Vert.	42.923	QP	39.40	13.52	5.82	32.21	0.00	26.53	40.0	13.4	100	265	
Vert.	375.011	QP	42.30	15.14	7.94	31.98	0.00	33.40	46.0	12.6	100	160	
Vert.	528.000	QP	35.90	18.24	8.56	32.01	0.00	30.69	46.0	15.3	100	240	
Vert.	2390.000	PK	54.00	27.58	13.43	46.21	2.23	51.03	73.9	22.8	143	148	
Vert.	2505.963	PK	59.50	28.06	13.52	46.09	2.23	57.22	73.9	16.6	132	167	
Vert.	2558.140	PK	56.30	28.23	13.57	46.01	2.23	54.32	73.9	19.5	151	154	
Vert.	4804.000	PK	53.50	32.49	5.49	45.74	2.23	47.97	73.9	25.9	150	0	
Vert.	6000.575	PK	56.30	34.90	6.14	45.45	2.23	54.12	73.9	19.7	150	200	
Vert.	7206.000	PK	48.70	37.06	6.72	44.87	2.23	49.84	73.9	24.0	150	0	
Vert.	9608.000	PK	48.40	37.96	7.51	43.24	2.23	52.86	73.9	21.0	150	0	
Vert.	2390.000	AV	42.30	27.58	13.43	46.21	2.23	39.33	53.9	14.5	143	148	VBW: 360 Hz
Vert.	2505.963	AV	48.20	28.06	13.52	46.09	2.23	45.92	53.9	7.9	132	167	VBW: 10 Hz
Vert.	2558.140	AV	45.10	28.23	13.57	46.01	2.23	43.12	53.9	10.7	151	154	VBW: 360 Hz*1)
Vert.	4804.000	AV	41.70	32.49	5.49	45.74	2.23	36.17	53.9	17.7	150	0	Floor noise
Vert.	6000.575	AV	49.10	34.90	6.14	45.45	2.23	46.92	53.9	6.9	150	200	VBW: 10 Hz
Vert.	7206.000	AV	38.10	37.06	6.72	44.87	2.23	39.24	53.9	14.6	150	0	Floor noise
Vert.	9608.000	AV	36.80	37.96	7.51	43.24	2.23	41.26	53.9	12.6	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) This noise has the same duty cycle as the carrier.
* These results have sufficient margin without taking account Dwell time factor.

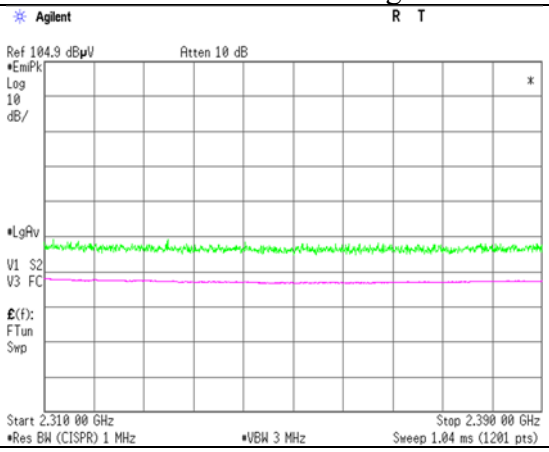
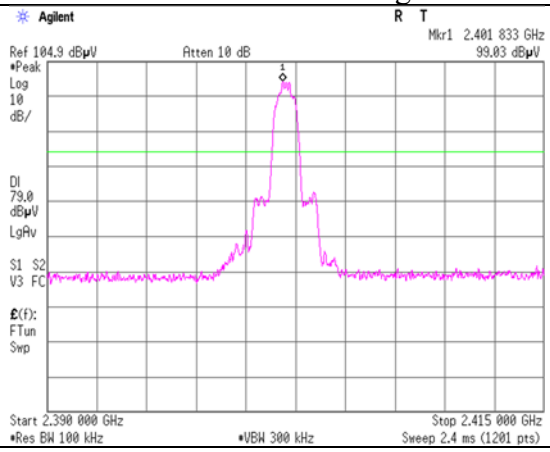
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

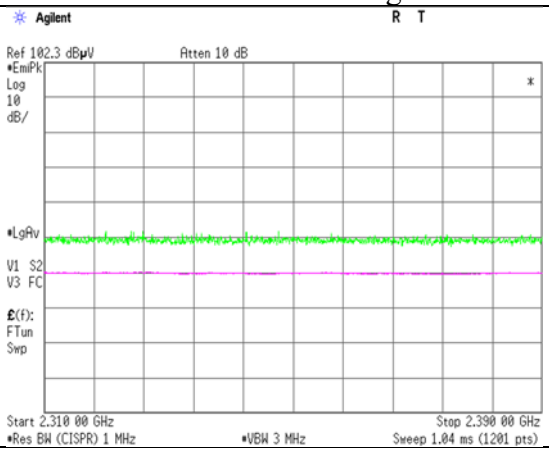
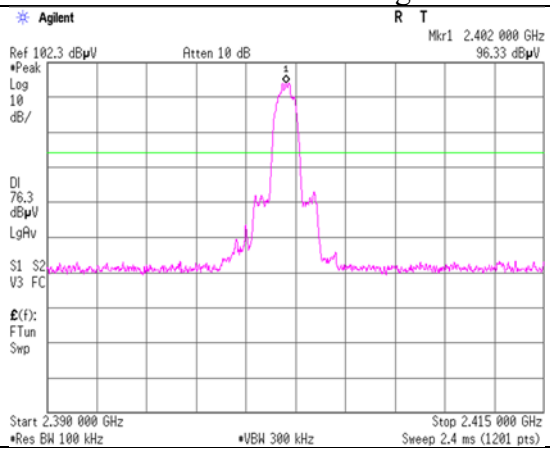
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	99.00	27.61	13.44	46.20	2.23	96.08	-	-	Carrier
Hori.	2400.000	PK	58.20	27.60	13.44	46.20	2.23	55.27	76.08	20.8	
Vert.	2402.000	PK	96.30	27.61	13.44	46.20	2.23	93.38	-	-	Carrier
Vert.	2400.000	PK	55.30	27.60	13.44	46.20	2.23	52.37	73.38	21.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	May 9, 2022
Temperature / Humidity	21 deg. C / 47 % RH
Engineer	Hiromitsu Tanabe
	(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	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	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	May 12, 2022	May 9, 2022	May 9, 2022	May 12, 2022
Temperature / Humidity	19 deg. C / 55 % RH	21 deg. C / 47 % RH	21 deg. C / 47 % RH	19 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(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.	55.770	QP	36.40	13.48	5.96	32.20	0.00	23.64	40.0	16.3	400	65	
Hori.	164.084	QP	45.70	13.19	6.82	32.11	0.00	33.60	43.5	9.9	255	320	
Hori.	250.005	QP	42.60	11.72	7.34	32.04	0.00	29.62	46.0	16.3	170	50	
Hori.	375.011	QP	51.20	15.14	7.94	31.98	0.00	42.30	46.0	**3.7**	100	190	
Hori.	528.000	QP	40.30	18.24	8.56	32.01	0.00	35.09	46.0	10.9	180	250	
Hori.	750.006	QP	40.50	21.99	9.35	31.98	0.00	39.86	46.0	6.1	110	240	
Hori.	2577.750	PK	59.20	28.34	13.58	45.98	2.23	57.37	73.9	16.5	145	154	
Hori.	2597.100	PK	56.30	28.44	13.60	45.94	2.23	54.63	73.9	19.2	150	268	
Hori.	4882.000	PK	50.90	32.54	5.52	45.73	2.23	45.46	73.9	28.4	150	0	
Hori.	6000.575	PK	56.10	34.90	6.14	45.45	2.23	53.92	73.9	19.9	210	130	
Hori.	7323.000	PK	49.50	37.22	6.74	44.69	2.23	51.00	73.9	22.9	150	0	
Hori.	9764.000	PK	47.80	37.94	7.56	43.16	2.23	52.37	73.9	21.5	150	0	
Hori.	2577.750	AV	48.10	28.34	13.58	45.98	2.23	46.27	53.9	7.6	145	154	VBW: 10 Hz
Hori.	2597.100	AV	46.40	28.44	13.60	45.94	2.23	44.73	53.9	9.1	150	268	VBW: 360 Hz*1)
Hori.	4882.000	AV	40.20	32.54	5.52	45.73	2.23	34.76	53.9	19.1	150	0	Floor noise
Hori.	6000.575	AV	46.60	34.90	6.14	45.45	2.23	44.42	53.9	9.4	210	130	VBW: 10 Hz
Hori.	7323.000	AV	38.40	37.22	6.74	44.69	2.23	39.90	53.9	14.0	150	0	Floor noise
Hori.	9764.000	AV	36.60	37.94	7.56	43.16	2.23	41.17	53.9	12.7	150	0	Floor noise
Vert.	42.923	QP	39.80	13.52	5.82	32.21	0.00	26.93	40.0	13.0	100	275	
Vert.	375.011	QP	42.20	15.14	7.94	31.98	0.00	33.30	46.0	12.7	100	160	
Vert.	750.006	QP	34.30	21.99	9.35	31.98	0.00	33.66	46.0	12.3	100	250	
Vert.	2505.157	PK	59.10	28.05	13.52	46.09	2.23	56.81	73.9	17.0	147	167	
Vert.	2597.100	PK	56.50	28.44	13.60	45.94	2.23	54.83	73.9	19.0	102	190	
Vert.	4882.000	PK	51.00	32.54	5.52	45.73	2.23	45.56	73.9	28.3	150	0	
Vert.	6000.575	PK	57.10	34.90	6.14	45.45	2.23	54.92	73.9	18.9	145	210	
Vert.	7323.000	PK	48.60	37.22	6.74	44.69	2.23	50.10	73.9	23.8	150	0	
Vert.	9764.000	PK	48.10	37.94	7.56	43.16	2.23	52.67	73.9	21.2	150	0	
Vert.	2505.157	AV	47.50	28.05	13.52	46.09	2.23	45.21	53.9	8.6	147	167	VBW: 10 Hz
Vert.	2597.100	AV	45.20	28.44	13.60	45.94	2.23	43.53	53.9	10.3	102	190	VBW: 360 Hz*1)
Vert.	4882.000	AV	40.10	32.54	5.52	45.73	2.23	34.66	53.9	19.2	150	0	Floor noise
Vert.	6000.575	AV	49.00	34.90	6.14	45.45	2.23	46.82	53.9	7.0	145	210	VBW: 10 Hz
Vert.	7323.000	AV	38.50	37.22	6.74	44.69	2.23	40.00	53.9	13.9	150	0	Floor noise
Vert.	9764.000	AV	36.60	37.94	7.56	43.16	2.23	41.17	53.9	12.7	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*1) This noise has the same duty cycle as the carrier.

* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	May 12, 2022	May 9, 2022	May 9, 2022	May 12, 2022
Temperature / Humidity	19 deg. C / 55 % RH	21 deg. C / 47 % RH	21 deg. C / 47 % RH	19 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(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.	55.770	QP	37.20	13.48	5.96	32.20	0.00	24.44	40.0	15.5	400	65	
Hori.	164.084	QP	45.70	13.19	6.82	32.11	0.00	33.60	43.5	9.9	240	330	
Hori.	250.005	QP	44.00	11.72	7.34	32.04	0.00	31.02	46.0	14.9	170	50	
Hori.	375.011	QP	51.30	15.14	7.94	31.98	0.00	42.40	46.0	**3.6**	100	190	
Hori.	528.000	QP	40.20	18.24	8.56	32.01	0.00	34.99	46.0	11.0	180	255	
Hori.	750.006	QP	39.60	21.99	9.35	31.98	0.00	38.96	46.0	7.0	110	240	
Hori.	2483.500	PK	54.30	27.94	13.51	46.12	2.23	51.86	73.9	22.0	159	277	
Hori.	2577.780	PK	60.00	28.34	13.58	45.98	2.23	58.17	73.9	15.7	152	159	
Hori.	2636.000	PK	54.50	28.61	13.62	45.88	2.23	53.08	73.9	20.8	164	288	
Hori.	4960.000	PK	51.30	32.66	5.57	45.73	2.23	46.03	73.9	27.8	150	0	
Hori.	6000.575	PK	57.10	34.90	6.14	45.45	2.23	54.92	73.9	18.9	235	130	
Hori.	7440.000	PK	49.70	37.25	6.77	44.64	2.23	51.31	73.9	22.5	150	0	
Hori.	9920.000	PK	47.00	38.14	7.62	43.23	2.23	51.76	73.9	22.1	150	0	
Hori.	2483.500	AV	42.90	27.94	13.51	46.12	2.23	40.46	53.9	13.4	159	277	VBW: 360 Hz
Hori.	2577.780	AV	47.90	28.34	13.58	45.98	2.23	46.07	53.9	7.8	152	159	VBW: 10 Hz
Hori.	2636.000	AV	43.90	28.61	13.62	45.88	2.23	42.48	53.9	11.4	164	288	VBW: 360 Hz*1)
Hori.	4960.000	AV	40.30	32.66	5.57	45.73	2.23	35.03	53.9	18.8	150	0	Floor noise
Hori.	6000.575	AV	47.50	34.90	6.14	45.45	2.23	45.32	53.9	8.5	235	130	VBW: 10 Hz
Hori.	7440.000	AV	39.00	37.25	6.77	44.64	2.23	40.61	53.9	13.2	150	0	Floor noise
Hori.	9920.000	AV	36.20	38.14	7.62	43.23	2.23	40.96	53.9	12.9	150	0	Floor noise
Vert.	42.923	QP	39.80	13.52	5.82	32.21	0.00	26.93	40.0	13.0	100	275	
Vert.	375.011	QP	42.80	15.14	7.94	31.98	0.00	33.90	46.0	12.1	100	165	
Vert.	750.006	QP	35.30	21.99	9.35	31.98	0.00	34.66	46.0	11.3	100	250	
Vert.	2483.500	PK	53.90	27.94	13.51	46.12	2.23	51.46	73.9	22.4	143	134	
Vert.	2505.859	PK	59.70	28.06	13.52	46.09	2.23	57.42	73.9	16.4	130	167	
Vert.	2636.000	PK	55.30	28.61	13.62	45.88	2.23	53.88	73.9	20.0	151	190	
Vert.	4960.000	PK	51.70	32.66	5.57	45.73	2.23	46.43	73.9	27.4	150	0	
Vert.	6000.575	PK	57.20	34.90	6.14	45.45	2.23	55.02	73.9	18.8	145	210	
Vert.	7440.000	PK	49.90	37.25	6.77	44.64	2.23	51.51	73.9	22.3	150	0	
Vert.	9920.000	PK	47.00	38.14	7.62	43.23	2.23	51.76	73.9	22.1	150	0	
Vert.	2483.500	AV	42.20	27.94	13.51	46.12	2.23	39.76	53.9	14.1	143	134	VBW: 360 Hz
Vert.	2505.859	AV	48.00	28.06	13.52	46.09	2.23	45.72	53.9	8.1	130	167	VBW: 10 Hz
Vert.	2636.000	AV	43.60	28.61	13.62	45.88	2.23	42.18	53.9	11.7	151	190	VBW: 360 Hz*1)
Vert.	4960.000	AV	40.70	32.66	5.57	45.73	2.23	35.43	53.9	18.4	150	0	Floor noise
Vert.	6000.575	AV	48.90	34.90	6.14	45.45	2.23	46.72	53.9	7.1	145	210	VBW: 10 Hz
Vert.	7440.000	AV	39.10	37.25	6.77	44.64	2.23	40.71	53.9	13.1	150	0	Floor noise
Vert.	9920.000	AV	36.20	38.14	7.62	43.23	2.23	40.96	53.9	12.9	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.33 dB

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*1) This noise has the same duty cycle as the carrier.

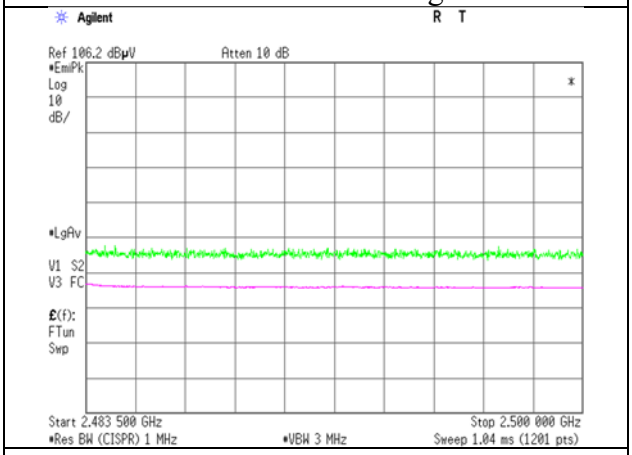
* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	May 9, 2022
Temperature / Humidity	21 deg. C / 47 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz - 2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

Horizontal

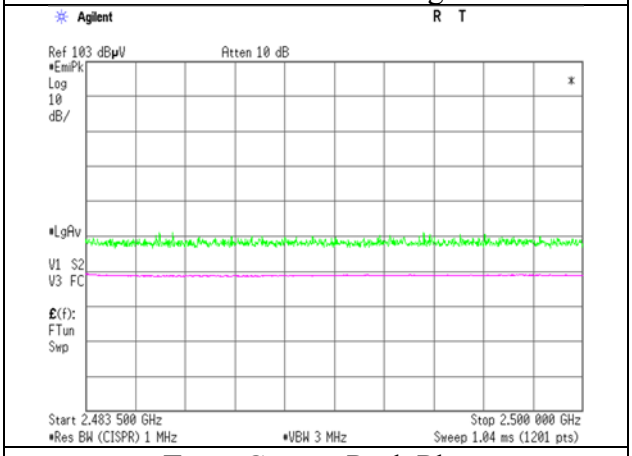
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

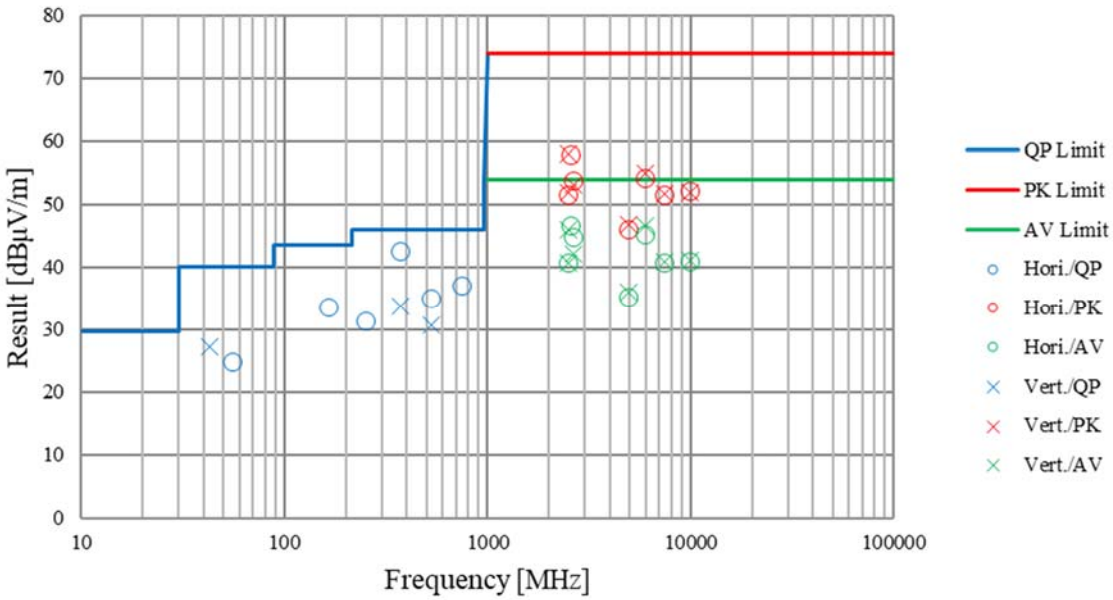


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	May 12, 2022	May 9, 2022	May 9, 2022	May 12, 2022
Temperature / Humidity	19 deg. C / 55 % RH	21 deg. C / 47 % RH	21 deg. C / 47 % RH	19 deg. C / 55 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 2.8 GHz)	(2.8 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz			



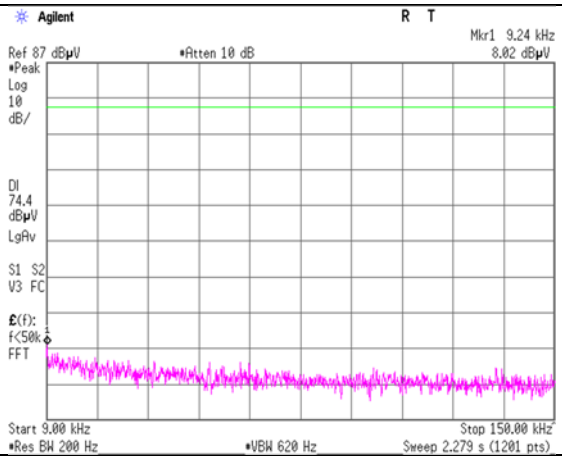
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

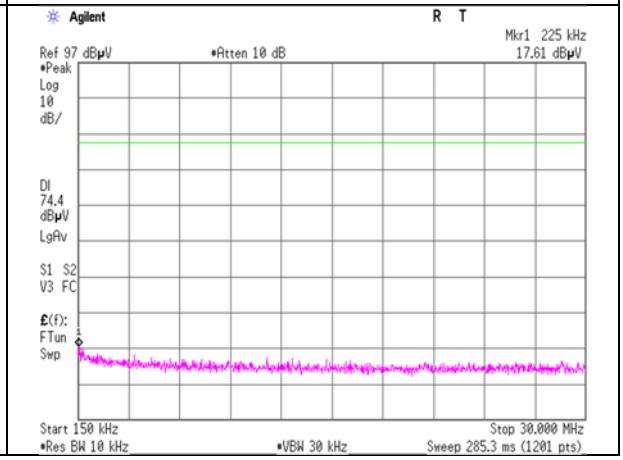
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping Off, DH5

2402 MHz

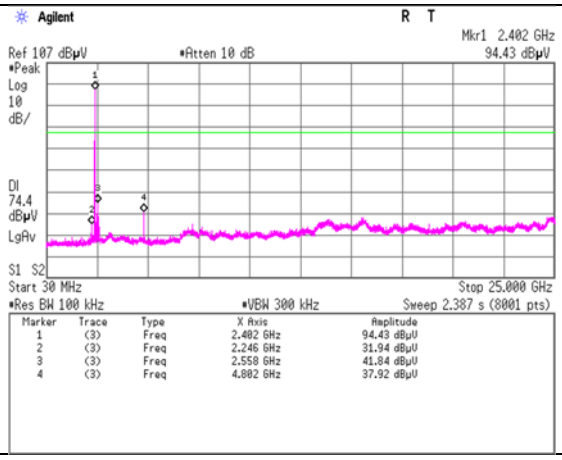
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

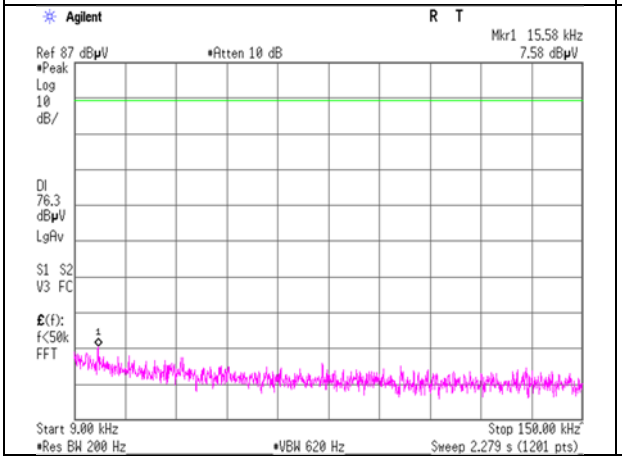


Conducted Spurious Emission

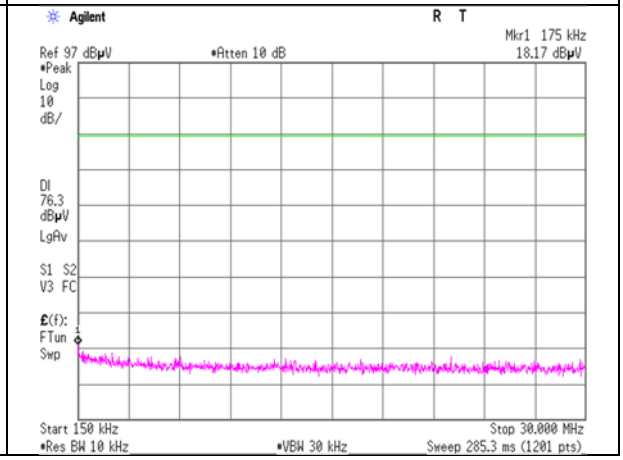
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping Off, DH5

2441 MHz

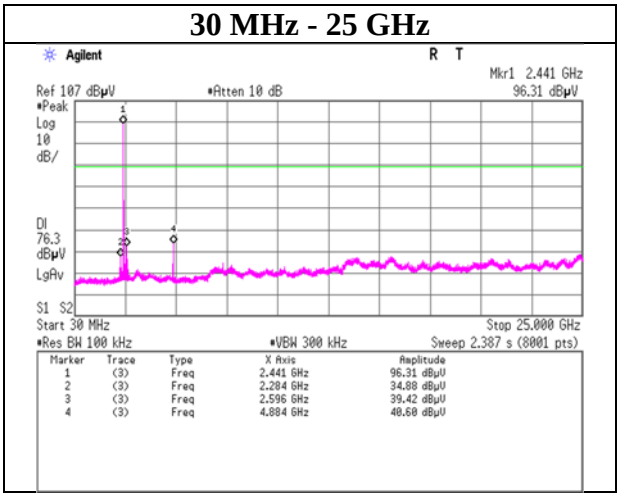
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

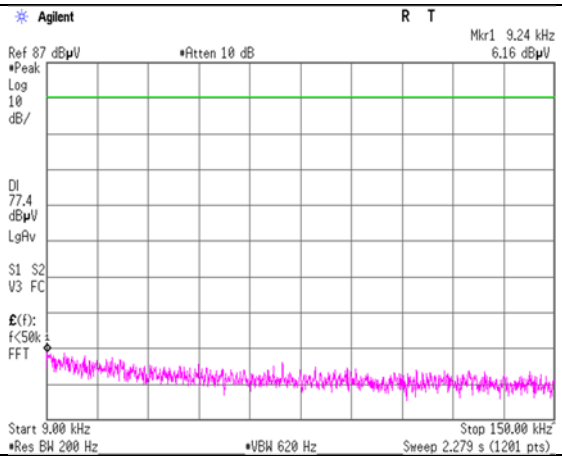


Conducted Spurious Emission

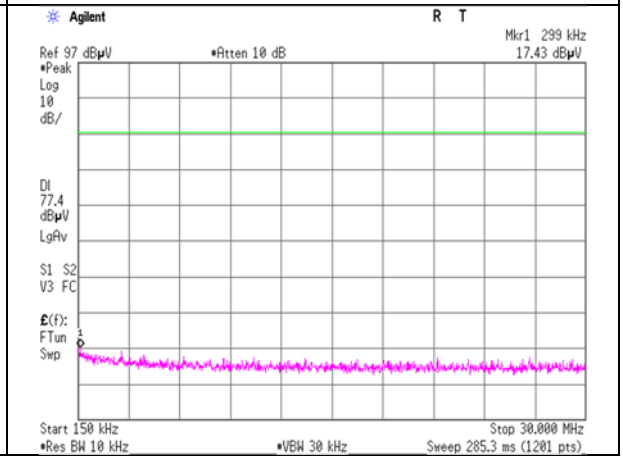
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping Off, DH5

2480 MHz

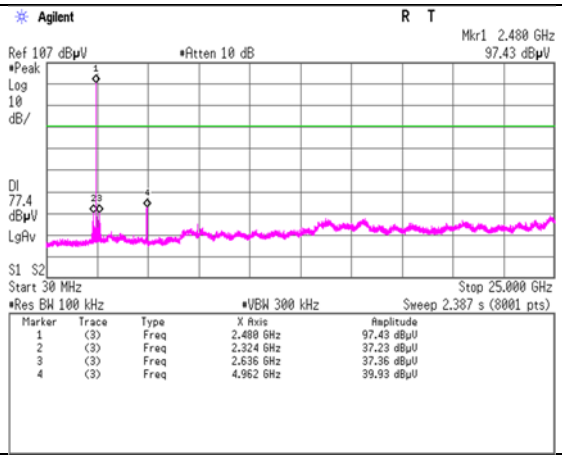
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

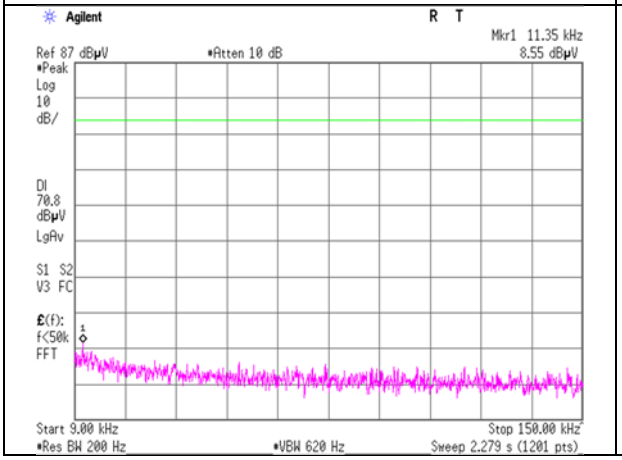


Conducted Spurious Emission

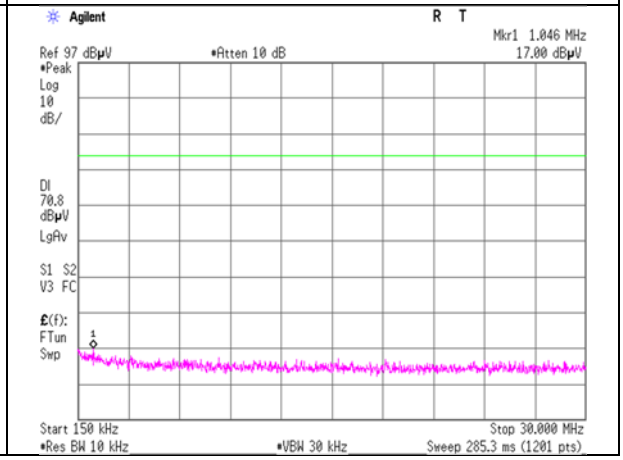
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping Off, 3DH5

2402 MHz

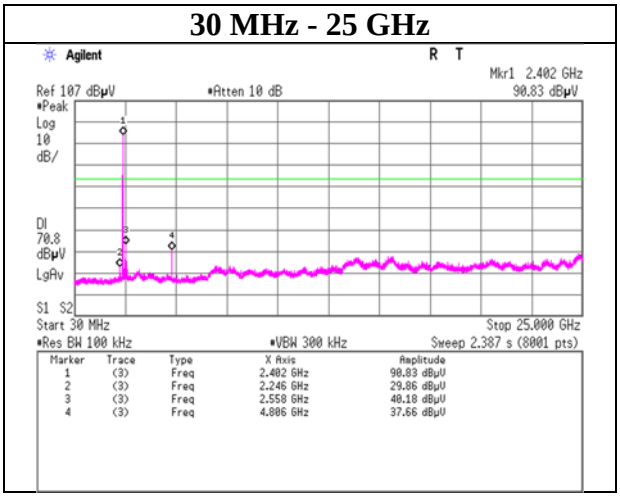
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

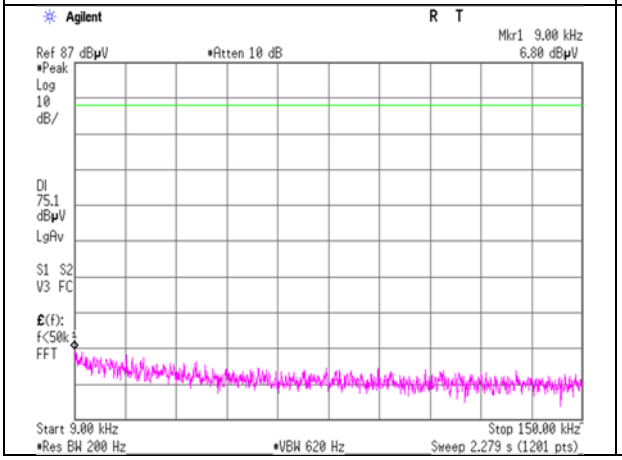


Conducted Spurious Emission

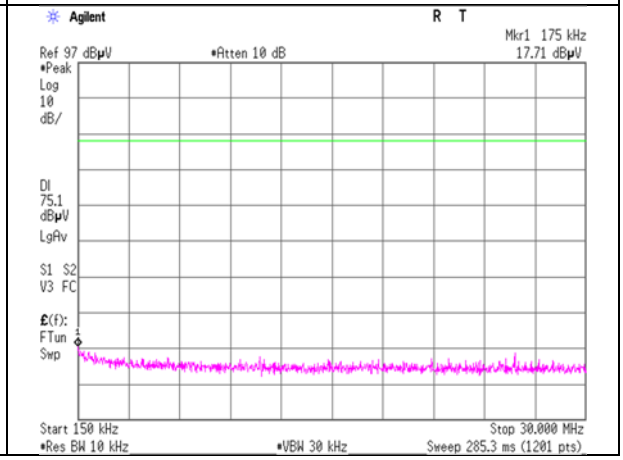
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping Off, 3DH5

2441 MHz

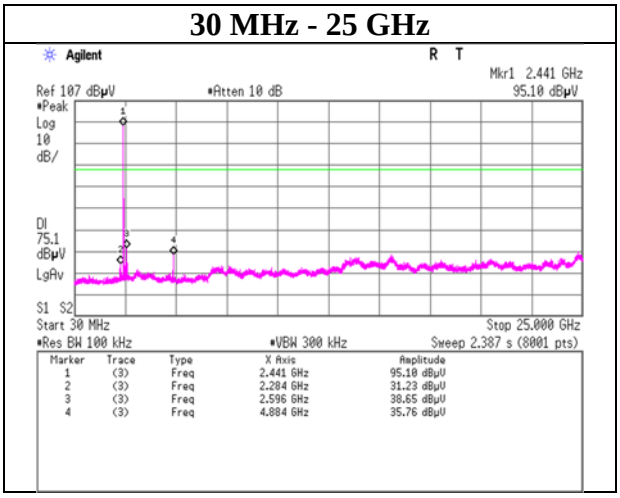
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

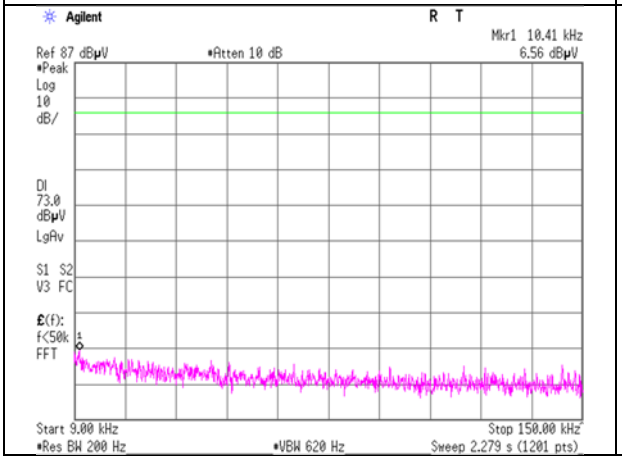


Conducted Spurious Emission

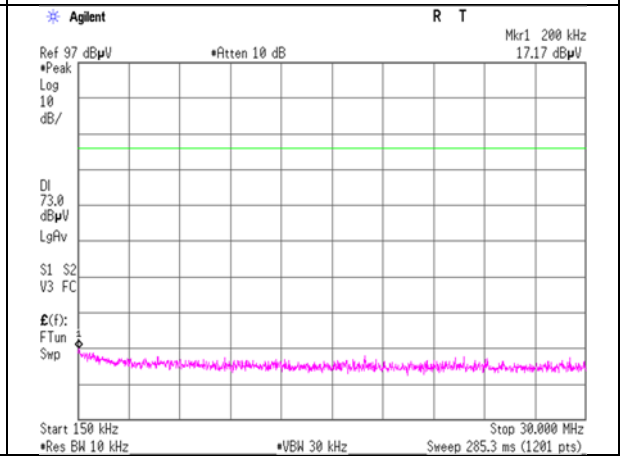
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx, Hopping Off, 3DH5

2480 MHz

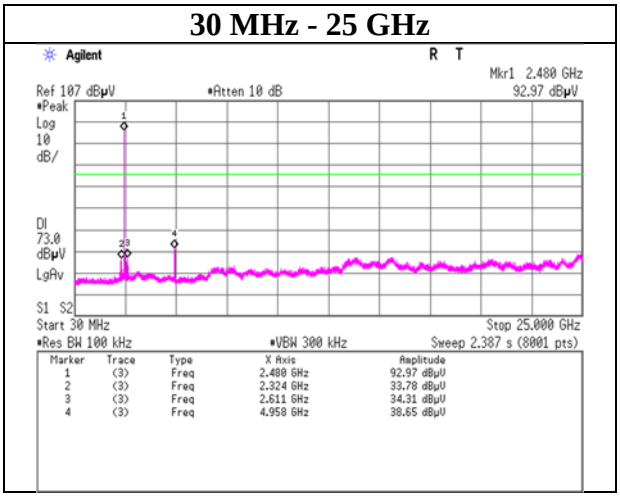
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz

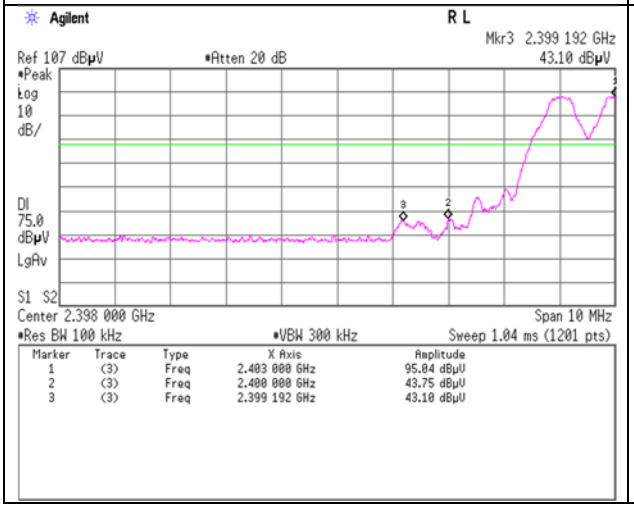


Conducted Emission Band Edge compliance

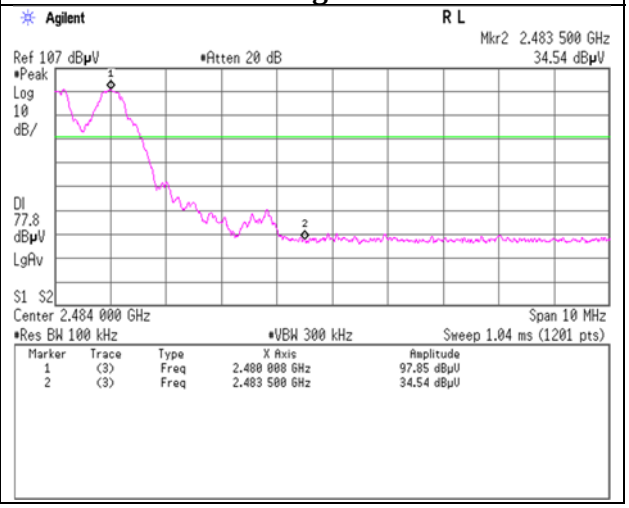
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx DH5

Hopping On

Low

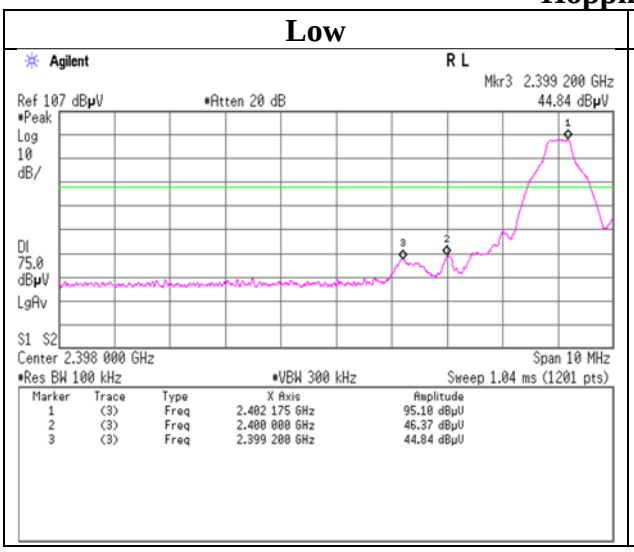


High

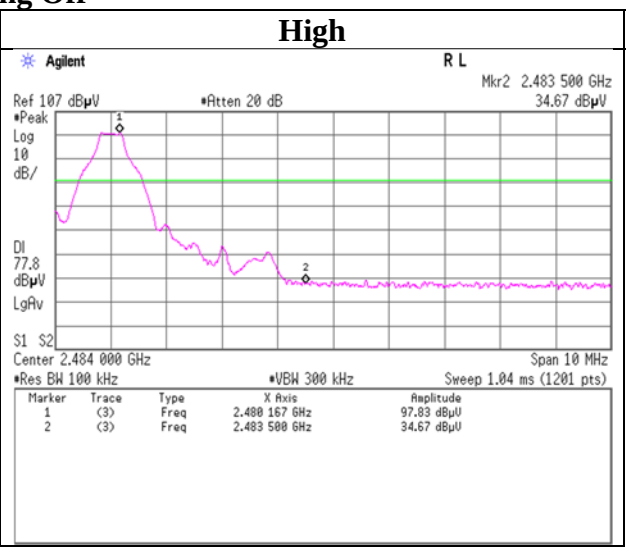


Hopping Off

Low



High

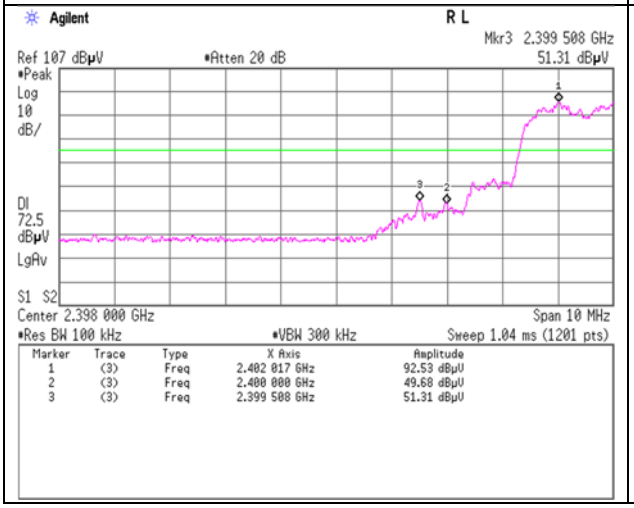


Conducted Emission Band Edge compliance

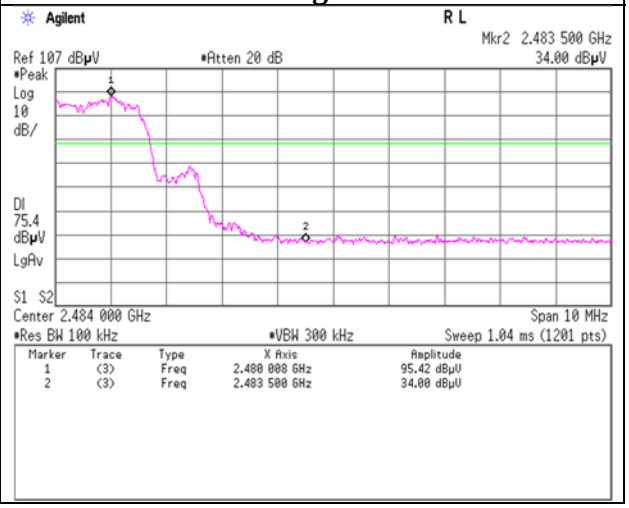
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	April 21, 2022
Temperature / Humidity	20 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx 3DH5

Hopping On

Low

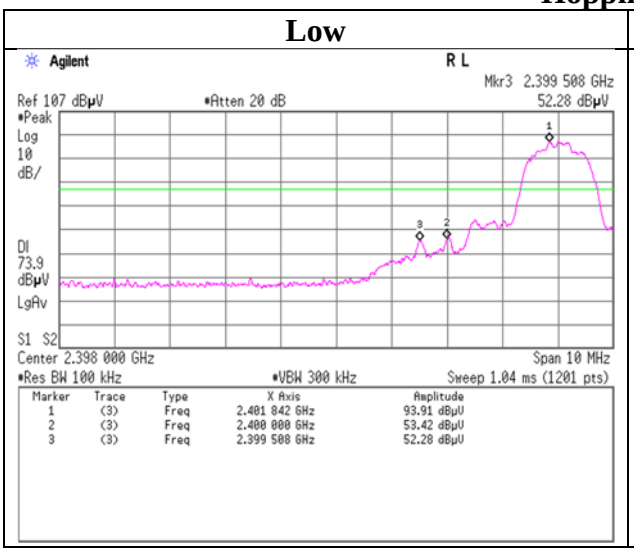


High

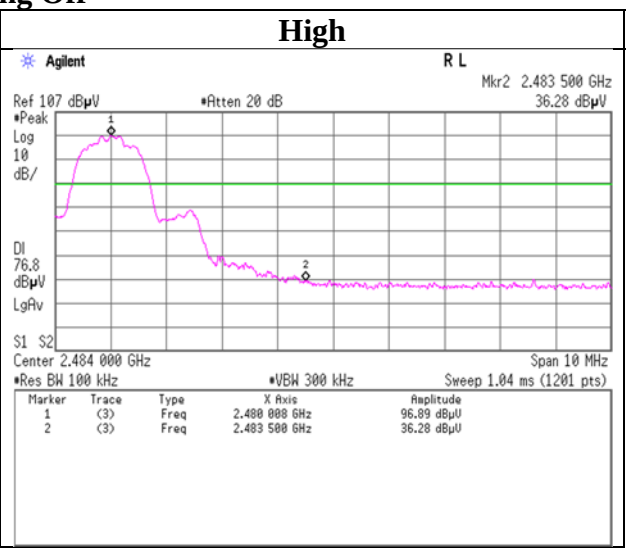


Hopping Off

Low



High



APPENDIX 2: Test Instruments

Test Equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	CSA-07	143643	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY52490024	2021/06/08	12
AT	CAT10-40	192240	10dB Fixed Attenuator	Weinschel Associates	54A-10	101826	2022/01/18	12
AT	CCC-W01	143109	Micro Wave Cable	Suhner	SUCOFLEX102	MY3662/2	2021/05/27	12
AT	CPM-16	143588	Peak Power Analyzer	Keysight Technologies Inc	8990B	MY51000276	2021/06/24	12
AT	CPSO-24	143606	Power Sensor	Keysight Technologies Inc	N1923A	MY54070024	2021/06/24	12
AT	CTS-08	144210	Digital Multimeter	Fluke Corporation	112	89790193	2021/10/11	12
AT	COS-27	200034	Temperature & Humidity Logger	HIOKI E.E. CORPORATION	LR5001/LR9504	200636456 /200699552	2021/07/20	12
AT	CBM-05	143128	Barometer	OTA	No.11	15404	2021/11/24	36
RE	CHA-25	143456	Double Ridged Wave Guide	ETS-Lindgren (Cedar Park, Texas)	3115	00204573	2022/02/05	12
RE	CHF-04	143442	HPF	MICRO-TRONICS	HPM50111-02	009	2021/05/14	12
RE	CAT10-17	143023	10dB Fixed Atten.	Weinschel - API Technologies Corp	54A-10	56251	2021/05/14	12
RE	CCC-G14	192241	Microwave Cable	Huber+Suhner	SF104/PC35m/PC35m /1000mm	805411/4	2022/01/18	12
RE	CCC-G17	192244	Microwave Cable	Huber+Suhner	SF104/11N/11PC35 /8000MM	808996/4	2022/01/18	12
RE	CSA-07	143643	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY52490024	2021/06/08	12
RE	CHA-07	143438	Double Ridged Horn	ETS-Lindgren (Cedar Park, Texas)	3160-09	00166043	2021/06/05	12
RE	CAF-19	142937	Pre-Amplifier	TOYO	HAP18-26W	00000035	2021/06/23	12
RE	CCC-W09	143113	Micro Wave Cable	Suhner	SUCOFLEX104	MY588/4	2021/08/03	12
RE	TSA-01	143642	Spectrum Analyzer	Keysight Technologies Inc	N9030A	MY53310670 Version A.13.12	2021/05/24	12
RE	CCC-S11-R	143169	11Site RE 3m System	N/A	none(No.11 RE)	none	2021/11/06	12
RE	CBL-09	143122	LOGBICON	Schwarzbeck Mess-Elektronik OHG	VULB 9168	508	2022/04/18	12
RE	CAT5-04	178807	5dB Fixed Atten.	Pasternack Enterprises	PE7047-5	none	2022/04/01	12
RE	CAF-16	142936	Pre-Amplifier	SONOMA INSTRUMENT	310N	325015	2021/05/27	12
RE	CTR-01	144193	Test Receiver	Rohde & Schwarz	ESU40	100426	2022/04/15	12
RE	CAEC-11 (NSA)	144648	Semi Anechoic Chamber	TDK	NSA (No.11)	11	2021/05/07	12
RE	CSCL-16	143655	Ruler	TAJIMA	G3 gold	none	-	-
RE	COS-26	200033	Temperature & Humidity Logger	HIOKI E.E. CORPORATION	LR5001/LR9504	200636447 /200699543	2021/07/20	12
RE	CTS-13	144215	Digital Multimeter	Fluke Corporation	FLK-83-V	14610320	2021/10/20	12
RE	CBM-02	143125	Barometer	OTA	No.11	15408	2021/11/24	36
RE	COTS-CEMI-03	178804	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3 (RE,CE,ME,PE)	-	-	-

***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