



Test report No.
Page
Issued date
FCC ID

: 14178608S-B-R1
: 1 of 26
: April 5, 2022
: H5P-333047

RADIO TEST REPORT

Test Report No. : 14178608S-B-R1

Applicant : TOPCON CORPORATION
Type of EUT : Bluetooth Module
Model Number of EUT : CYBT-333047-02
FCC ID : H5P-333047
Test regulation : FCC Part 15 Subpart C: 2021
*Bluetooth BR/EDR part
Test item : Spurious Emission (Radiated)
Test result : Complied (Refer to SECTION 3)

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2. The results in this report apply only to the sample tested.
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4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 14178608S-B. 14178608S-B is replaced with this report.

Date of test: February 2 to 4, 2022

Representative test engineer:

Y. Tanikawara

Yusuke Tanikawara
Engineer

Approved by:

K. Noda

Kazuya Noda
Leader



CERTIFICATE 1266.03

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

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Report Cover Page - 13-EM-F0429 Issue # 19.0

REVISION HISTORY

Original Test Report No.: 14178608S-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	14178608S-B	March 22, 2022	-	-
1	14178608S-B-R1	April 5, 2022	P.13, 15, 16, 18, 20, 21	Correction of reference report no. From: 13473127S-A To: 13473127S-A-R2

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Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name : TOPCON CORPORATION
 Address : 75-1, Hasunuma-cho, Itabashi-ku, Tokyo, 174-8580 Japan
 Telephone Number : +81-03-3558-2577
 Contact Person : Eiji Takeuchi

The information provided from the customer is as follows;

- Applicant, Type 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
 - 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

Type : Bluetooth Module
 Model Number : CYBT-333047-02
 Serial Number : Refer to SECTION 4.2
 Receipt Date : January 17, 2022
 Condition : Production model
 Modification : No Modification by the test lab.

2.2 Product Description

Model: CYBT-333047-02 (referred to as the EUT in this report) is a Bluetooth Module.

General Specification

Rating	DC 2.3 V to 3.6 V
--------	-------------------

Radio Specification

Bluetooth Low Energy

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	GFSK, $\pi/4$ -DQPSK, 8DPSK
Operating Temperature	-40 deg. C to +85 deg. C
Clock frequency	24 MHz

Antenna Type	Antenna Gain	Remarks
1/2 λ sleeve antenna	2.14 dBi	original
PCB Antenna (TOP)	2.0 dBi	tested antenna *1)
PCB Antenna (BOTTOM)	1.1 dBi	*1)

*This is a test report for adding a PCB Antenna.

*1) Since it is the same type of antenna, we tested it with the Antenna higher Antenna Gain.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	10.9dB 143.900 MHz, QP, Hori. Mode: Tx, 3DH5 2480 MHz	Complied a)	Radiated (above 30 MHz) *1)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) Radiated test was selected over 30 MHz based on section 15.247(d).					
a) 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.			

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)

The RF Module has its own regulator. The RF Module is constantly provided voltage through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique coupling/antenna connector (U.FL). Therefore, the equipment complies with the antenna requirement.

3.3 Addition to standard

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 $k = 2$.

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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

3.5 Test Location

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A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Radiated Spurious Emission	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2 Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: Fixed Software: Cybluetool Version 0.1.97.1 (Date: 2022.1.28, 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.		

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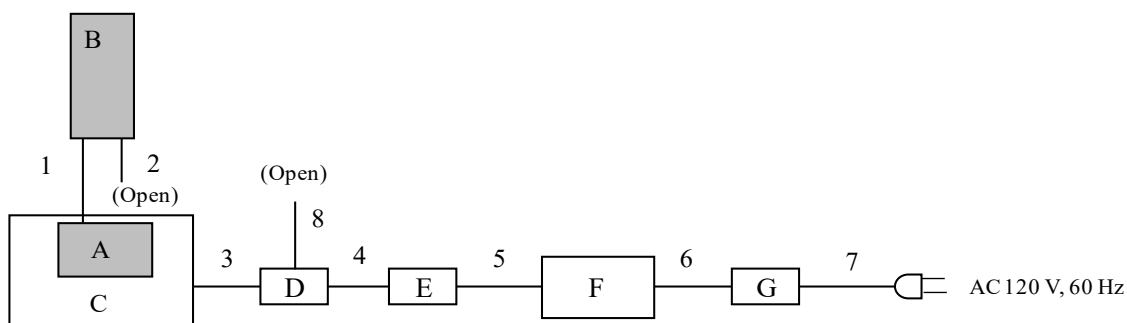
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4.2 Configuration and peripherals



* 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	Bluetooth Module	CYBT-333047-02	3330470206211610CZK	Cypress Semiconductor	EUT
B	PCB Antenna	2130520510	001	SANSEI ELECTRIC CO., LTD	EUT
C	Jig board	BT_CY333047	1042071-01	TOPCON	-
D	Jig board	XML-2	-	-	-
E	Jig board	LC234X	-	-	-
F	Laptop Computer	ThinkPad E14 Gen2	PF397TS8	LENOVO	-
G	AC Adapter	ADLX65YCC2D	8SSA10R16922C2TJ19M0AZJ	LENOVO	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna	0.14	Shielded	Shielded	-
2	Antenna	0.12	Shielded	Shielded	-
3	Signal	0.2	Unshielded	Unshielded	-
4	Signal	0.05	Unshielded	Unshielded	-
5	USB	1.0	Shielded	Shielded	-
6	DC	1.8	Unshielded	Unshielded	-
7	AC	0.9	Unshielded	Unshielded	-
8	DC	0.35	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 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	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.

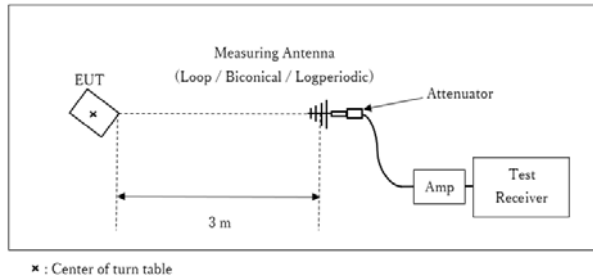
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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).

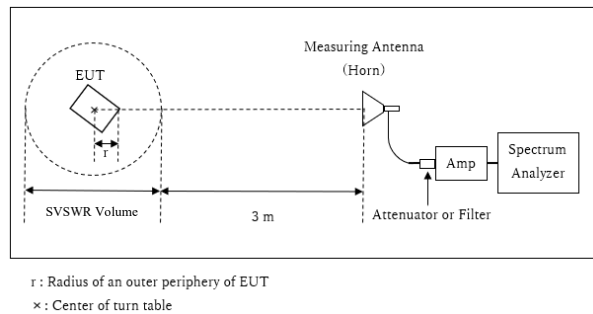
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.9 \text{ m} / 3.0 \text{ m}) = 2.28 \text{ dB}$

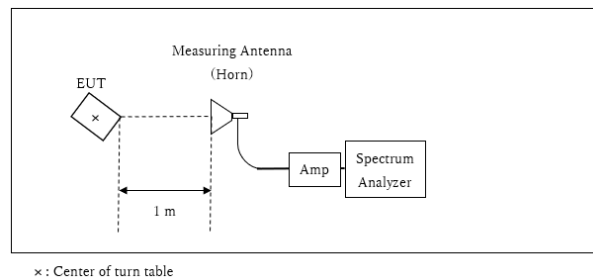
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.9 \text{ m}$

SVSWR Volume : 2.0 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.1 \text{ m}$

10 GHz - 26.5 GHz



Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Module

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

Antenna

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

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30 MHz - 26.5 GHz
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Radiated Spurious Emission

Report No. 14178608S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 2 2 2
Date February 4, 2022 February 2, 2022 February 3, 2022 February 3, 2022
Temperature / Humidity 21 deg.C, 25 %RH 22 deg.C, 30 %RH 21 deg.C, 26 %RH 23 deg.C, 31 %RH
Engineer Miku Ikudome Yusuke Tanikawara Miku Ikudome Yusuke Tanikawara
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	143.829	QP	40.65	14.52	8.53	31.83	0.00	31.87	43.5	11.6	218	359	-
Hori.	323.723	QP	35.96	14.54	6.65	31.66	0.00	25.49	46.0	20.5	100	331	-
Hori.	539.391	QP	33.52	17.86	7.96	31.64	0.00	27.70	46.0	18.3	100	277	-
Hori.	1441.200	PK	54.62	25.66	13.18	38.92	2.28	56.82	73.9	17.0	148	247	-
Hori.	2378.092	PK	46.49	28.60	14.15	38.73	2.28	52.79	73.9	21.1	257	252	-
Hori.	2390.000	PK	45.01	28.58	14.16	38.72	2.28	51.31	73.9	22.5	257	252	-
Hori.	3843.187	PK	50.03	30.43	6.24	38.21	2.28	50.77	73.9	23.1	175	255	-
Hori.	4804.000	PK	54.67	31.75	6.71	38.55	2.28	56.86	73.9	17.0	149	262	-
Hori.	7206.000	PK	48.11	37.60	8.25	39.16	2.28	57.08	73.9	16.8	149	228	-
Vert.	50.936	QP	39.35	10.82	7.28	31.90	0.00	25.55	40.0	14.4	100	103	-
Vert.	143.829	QP	32.36	14.52	8.53	31.83	0.00	23.58	43.5	19.9	254	92	-
Vert.	191.895	QP	28.52	16.40	8.80	31.79	0.00	21.93	43.5	21.5	100	273	-
Vert.	227.780	QP	38.46	11.42	5.94	31.74	0.00	24.08	46.0	21.9	100	337	-
Vert.	323.723	QP	35.91	14.54	6.65	31.66	0.00	25.44	46.0	20.5	131	213	-
Vert.	539.391	QP	31.08	17.86	7.96	31.64	0.00	25.26	46.0	20.7	100	117	-
Vert.	1441.200	PK	53.74	25.66	13.18	38.92	2.28	55.94	73.9	17.9	376	20	-
Vert.	2378.000	PK	46.33	28.60	14.15	38.73	2.28	52.63	73.9	21.2	147	214	-
Vert.	2390.000	PK	45.65	28.58	14.16	38.72	2.28	51.95	73.9	21.9	147	214	-
Vert.	3843.187	PK	48.01	30.43	6.24	38.21	2.28	48.75	73.9	25.1	191	308	-
Vert.	4804.000	PK	53.83	31.75	6.71	38.55	2.28	56.02	73.9	17.8	102	202	-
Vert.	7206.000	PK	47.32	37.60	8.25	39.16	2.28	56.29	73.9	17.6	151	115	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.	1441.200	PK	54.62	25.66	13.18	38.92	-24.73	2.28	32.09	53.9	21.8	*2)
Hori.	2378.092	PK	46.49	28.60	14.15	38.73	-24.73	2.28	28.06	53.9	25.8	*2)
Hori.	2390.000	PK	45.01	28.58	14.16	38.72	-24.73	2.28	26.58	53.9	27.3	*1)
Hori.	3843.187	PK	50.03	30.43	6.24	38.21	-24.73	2.28	26.04	53.9	27.8	*2)
Hori.	4804.000	PK	54.67	31.75	6.71	38.55	-24.73	2.28	32.13	53.9	21.7	-
Hori.	7206.000	PK	48.11	37.60	8.25	39.16	-24.73	2.28	32.35	53.9	21.5	-
Vert.	1441.200	PK	53.74	25.66	13.18	38.92	-24.73	2.28	31.21	53.9	22.6	*2)
Vert.	2378.000	PK	46.33	28.60	14.15	38.73	-24.73	2.28	27.90	53.9	26.0	*2)
Vert.	2390.000	PK	45.65	28.58	14.16	38.72	-24.73	2.28	27.22	53.9	26.6	*1)
Vert.	3843.187	PK	48.01	30.43	6.24	38.21	-24.73	2.28	24.02	53.9	29.8	*2)
Vert.	4804.000	PK	53.83	31.75	6.71	38.55	-24.73	2.28	31.29	53.9	22.6	-
Vert.	7206.000	PK	47.32	37.60	8.25	39.16	-24.73	2.28	31.56	53.9	22.3	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet of Report No.13473127S-A-R2.

*1) Not out of band emission (Leakage Power)

*2) These point are the same duty cycle as carrier.

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	101.16	28.56	14.18	38.72	2.28	107.46	-	-	Carrier
Hori.	2400.000	PK	44.32	28.56	14.17	38.72	2.28	50.61	87.4	36.7	-
Vert.	2402.000	PK	100.93	28.56	14.18	38.72	2.28	107.23	-	-	Carrier
Vert.	2400.000	PK	42.44	28.56	14.17	38.72	2.28	48.73	87.2	38.4	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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Shonan EMC Lab.

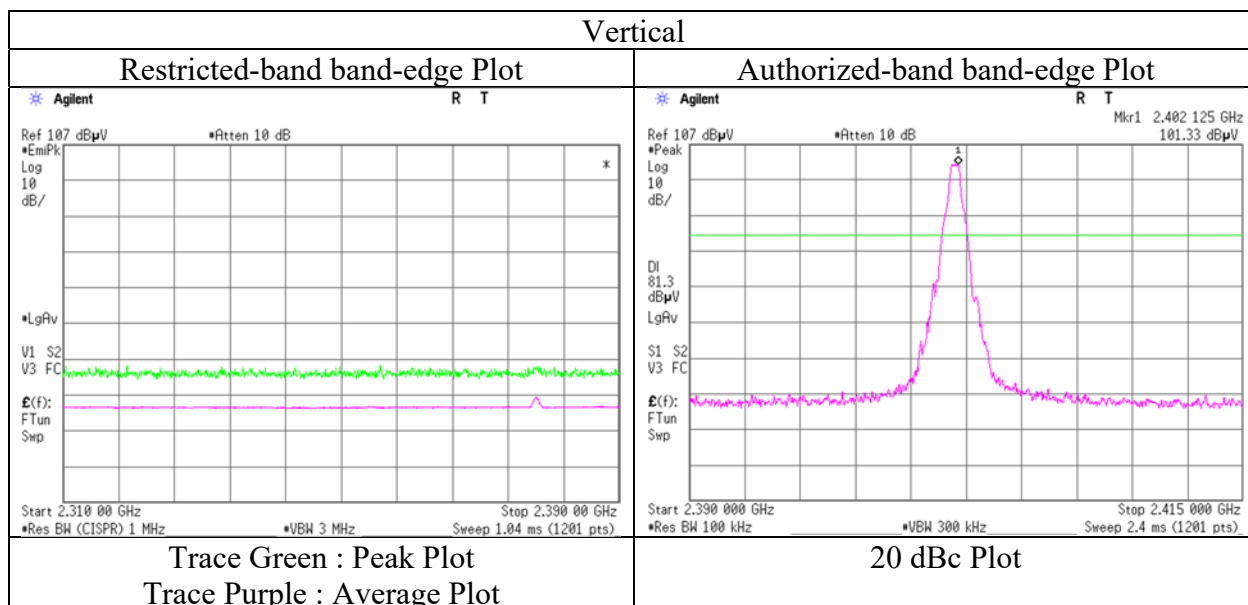
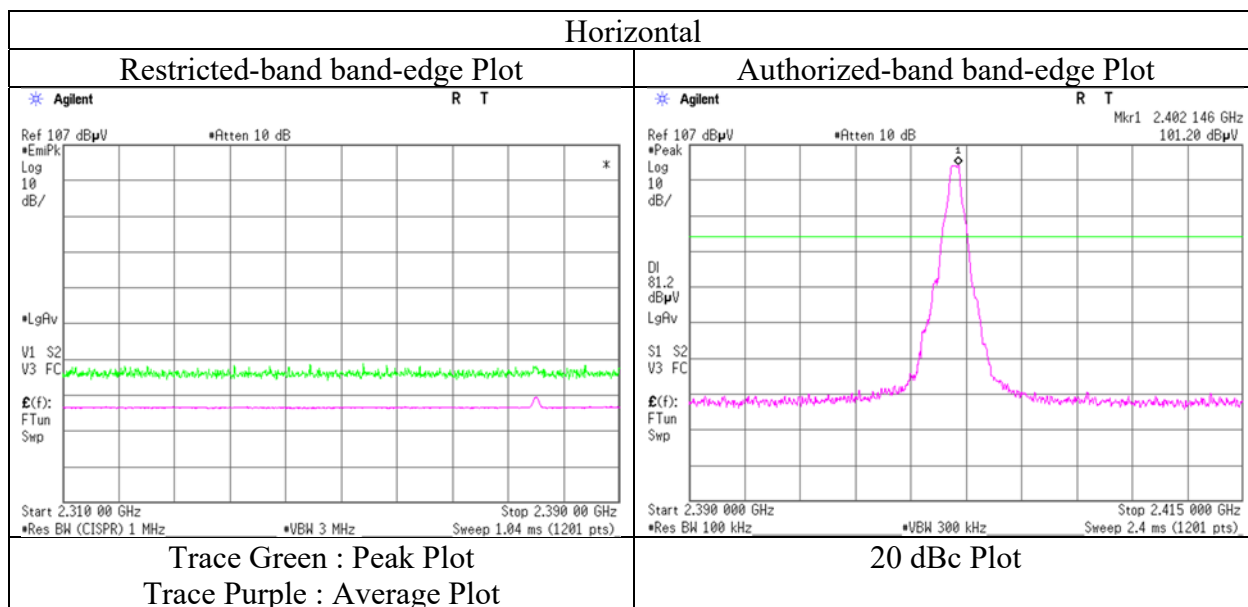
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	14178608S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	February 2, 2022
Temperature / Humidity	22 deg.C, 30 %RH
Engineer	Yusuke Tanikawara
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



* 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.

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Radiated Spurious Emission

Report No.	14178608S-B-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	February 4, 2022	February 2, 2022	February 3, 2022	February 3, 2022
Temperature / Humidity	21 deg.C, 25 %RH	22 deg.C, 30 %RH	21 deg.C, 26 %RH	23 deg.C, 31 %RH
Engineer	Miku Ikudome	Yusuke Tanikawara	Miku Ikudome	Yusuke Tanikawara
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	143.923	QP	41.01	14.53	8.53	31.83	0.00	32.24	43.5	11.2	238	359	-
Hori.	323.691	QP	35.95	14.54	6.65	31.66	0.00	25.48	46.0	20.5	100	332	-
Hori.	539.336	QP	33.55	17.86	7.96	31.64	0.00	27.73	46.0	18.2	100	280	-
Hori.	1464.600	PK	55.65	25.58	13.21	38.92	2.28	57.80	73.9	16.1	183	247	-
Hori.	3905.574	PK	49.21	30.47	6.28	38.20	2.28	50.04	73.9	23.8	147	254	-
Hori.	4882.000	PK	51.00	31.78	6.75	38.59	2.28	53.22	73.9	20.6	148	253	-
Hori.	7323.000	PK	49.56	37.76	8.34	39.22	2.28	58.72	73.9	15.1	104	230	-
Vert.	50.966	QP	39.80	10.81	7.28	31.90	0.00	25.99	40.0	14.0	100	106	-
Vert.	143.936	QP	32.72	14.53	8.54	31.83	0.00	23.96	43.5	19.5	252	99	-
Vert.	191.797	QP	28.31	16.41	8.80	31.79	0.00	21.73	43.5	21.7	100	273	-
Vert.	227.799	QP	38.50	11.42	5.94	31.74	0.00	24.12	46.0	21.8	100	334	-
Vert.	323.697	QP	35.96	14.54	6.65	31.66	0.00	25.49	46.0	20.5	135	206	-
Vert.	539.364	QP	31.10	17.86	7.96	31.64	0.00	25.28	46.0	20.7	100	112	-
Vert.	1464.600	PK	54.37	25.58	13.21	38.92	2.28	56.52	73.9	17.3	396	296	-
Vert.	3905.574	PK	48.16	30.47	6.28	38.20	2.28	48.99	73.9	24.9	373	320	-
Vert.	4882.000	PK	51.89	31.78	6.75	38.59	2.28	54.11	73.9	19.7	133	61	-
Vert.	7323.000	PK	48.13	37.76	8.34	39.22	2.28	57.29	73.9	16.6	158	115	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.90 m / 3.0 m) = 2.28 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.	1464.600	PK	55.65	25.58	13.21	38.92	-24.73	2.28	33.07	53.9	20.8	*1)
Hori.	3905.574	PK	49.21	30.47	6.28	38.20	-24.73	2.28	25.31	53.9	28.5	*1)
Hori.	4882.000	PK	51.00	31.78	6.75	38.59	-24.73	2.28	28.49	53.9	25.4	-
Hori.	7323.000	PK	49.56	37.76	8.34	39.22	-24.73	2.28	33.99	53.9	19.9	-
Vert.	1464.600	PK	54.37	25.58	13.21	38.92	-24.73	2.28	31.79	53.9	22.1	*1)
Vert.	3905.574	PK	48.16	30.47	6.28	38.20	-24.73	2.28	24.26	53.9	29.6	*1)
Vert.	4882.000	PK	51.89	31.78	6.75	38.59	-24.73	2.28	29.38	53.9	24.5	-
Vert.	7323.000	PK	48.13	37.76	8.34	39.22	-24.73	2.28	32.56	53.9	21.3	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.90 m / 3.0 m) = 2.28 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 of Report No.13473127S-A-R2.

*1) These point are the same duty cycle as carrier.

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Radiated Spurious Emission

Report No. 14178608S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 2 2 2
Date February 4, 2022 February 2, 2022 February 3, 2022 February 3, 2022
Temperature / Humidity 21 deg.C, 25 %RH 22 deg.C, 30 %RH 21 deg.C, 26 %RH 23 deg.C, 31 %RH
Engineer Miku Ikudome Yusuke Tanikawara Miku Ikudome Yusuke Tanikawara
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	143.840	QP	40.91	14.52	8.53	31.83	0.00	32.13	43.5	11.3	219	358	-
Hori.	323.651	QP	36.09	14.54	6.65	31.66	0.00	25.62	46.0	20.3	100	335	-
Hori.	539.328	QP	33.45	17.86	7.96	31.64	0.00	27.63	46.0	18.3	100	278	-
Hori.	1488.000	PK	58.63	25.53	13.24	38.91	2.28	60.77	73.9	13.1	138	250	-
Hori.	2483.500	PK	47.35	28.47	14.26	38.67	2.28	53.69	73.9	20.2	232	62	-
Hori.	3968.003	PK	50.04	30.49	6.31	38.20	2.28	50.92	73.9	22.9	128	86	-
Hori.	4960.000	PK	53.03	32.03	6.81	38.62	2.28	55.53	73.9	18.3	130	103	-
Hori.	7440.000	PK	51.11	37.82	8.42	39.28	2.28	60.35	73.9	13.5	117	33	-
Vert.	50.971	QP	39.72	10.81	7.28	31.90	0.00	25.91	40.0	14.0	100	108	-
Vert.	143.865	QP	32.70	14.52	8.53	31.83	0.00	23.92	43.5	19.5	257	94	-
Vert.	191.809	QP	28.40	16.41	8.80	31.79	0.00	21.82	43.5	21.6	100	276	-
Vert.	227.808	QP	38.51	11.42	5.94	31.74	0.00	24.13	46.0	21.8	100	339	-
Vert.	323.673	QP	36.20	14.54	6.65	31.66	0.00	25.73	46.0	20.2	133	212	-
Vert.	539.339	QP	31.03	17.86	7.96	31.64	0.00	25.21	46.0	20.7	100	116	-
Vert.	1488.000	PK	55.48	25.53	13.24	38.91	2.28	57.62	73.9	16.2	357	306	-
Vert.	2483.500	PK	47.77	28.47	14.26	38.67	2.28	54.11	73.9	19.7	140	284	-
Vert.	3967.992	PK	49.73	30.49	6.31	38.20	2.28	50.61	73.9	23.2	189	354	-
Vert.	4960.000	PK	52.67	32.03	6.81	38.62	2.28	55.17	73.9	18.7	133	141	-
Vert.	7440.000	PK	48.69	37.82	8.42	39.28	2.28	57.93	73.9	15.9	145	277	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.90 m / 3.0 m) = 2.28 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.	1488.000	PK	58.63	25.53	13.24	38.91	-24.73	2.28	36.04	53.9	17.8	*2)
Hori.	2483.500	PK	47.35	28.47	14.26	38.67	-24.73	2.28	28.96	53.9	24.9	*1)
Hori.	3968.003	PK	50.04	30.49	6.31	38.20	-24.73	2.28	26.19	53.9	27.7	*2)
Hori.	4960.000	PK	53.03	32.03	6.81	38.62	-24.73	2.28	30.80	53.9	23.1	-
Hori.	7440.000	PK	51.11	37.82	8.42	39.28	-24.73	2.28	35.62	53.9	18.2	-
Vert.	1488.000	PK	55.48	25.53	13.24	38.91	-24.73	2.28	32.89	53.9	21.0	*2)
Vert.	2483.500	PK	47.77	28.47	14.26	38.67	-24.73	2.28	29.38	53.9	24.5	*1)
Vert.	3967.992	PK	49.73	30.49	6.31	38.20	-24.73	2.28	25.88	53.9	28.0	*2)
Vert.	4960.000	PK	52.67	32.03	6.81	38.62	-24.73	2.28	30.44	53.9	23.4	-
Vert.	7440.000	PK	48.69	37.82	8.42	39.28	-24.73	2.28	33.20	53.9	20.7	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.90 m / 3.0 m) = 2.28 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 of Report No.13473127S-A-R2.

*1) Not out of band emission (Leakage Power)

*2) These point are the same duty cycle as carrier.

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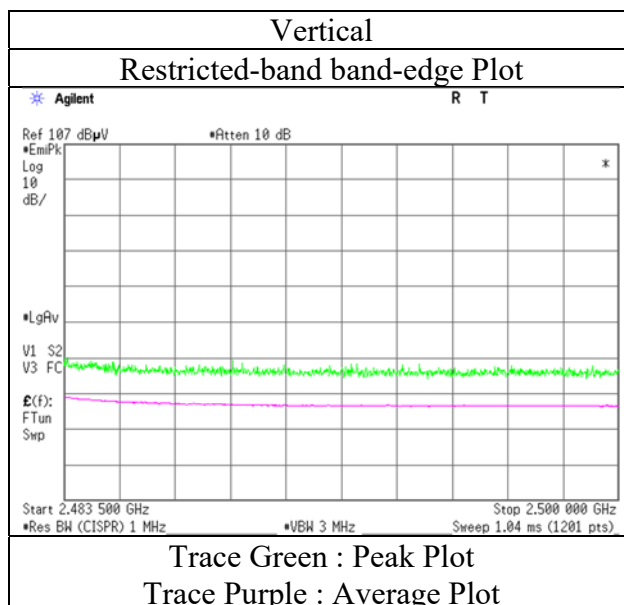
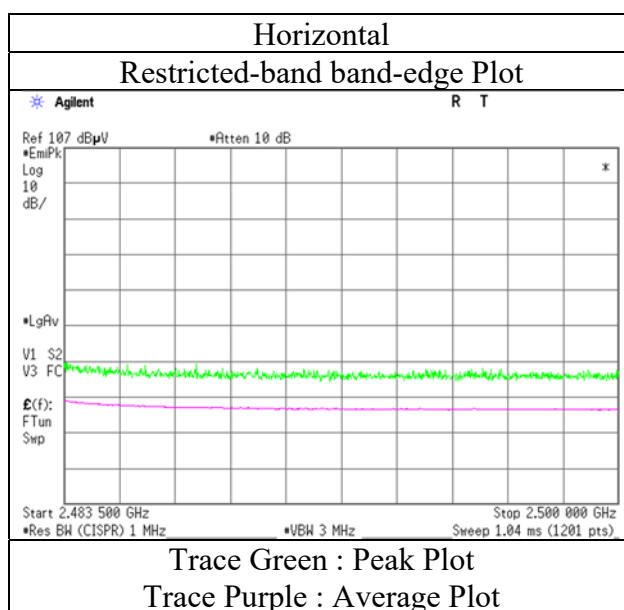
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	14178608S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	February 2, 2022
Temperature / Humidity	22 deg.C, 30 %RH
Engineer	Yusuke Tanikawara (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz



* 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.

UL Japan, Inc.

Shonan EMC Lab.

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Radiated Spurious Emission

Report No. 14178608S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 2 2 2
Date February 4, 2022 February 2, 2022 February 3, 2022 February 3, 2022
Temperature / Humidity 21 deg.C, 25 %RH 22 deg.C, 30 %RH 21 deg.C, 26 %RH 23 deg.C, 31 %RH
Engineer Miku Ikudome Yusuke Tanikawara Miku Ikudome Yusuke Tanikawara
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	143.872	QP	40.99	14.52	8.53	31.83	0.00	32.21	43.5	11.2	218	354	-
Hori.	323.612	QP	36.10	14.53	6.65	31.66	0.00	25.62	46.0	20.3	100	334	-
Hori.	539.358	QP	33.61	17.86	7.96	31.64	0.00	27.79	46.0	18.2	100	288	-
Hori.	1441.200	PK	52.85	25.66	13.18	38.92	2.28	55.05	73.9	18.8	146	253	-
Hori.	2378.062	PK	45.79	28.60	14.15	38.73	2.28	52.09	73.9	21.8	253	251	-
Hori.	2390.000	PK	45.39	28.58	14.16	38.72	2.28	51.69	73.9	22.2	253	251	-
Hori.	3843.181	PK	49.42	30.43	6.24	38.21	2.28	50.16	73.9	23.7	178	254	-
Hori.	4804.000	PK	53.62	31.75	6.71	38.55	2.28	55.81	73.9	18.0	111	92	-
Hori.	7206.000	PK	44.14	37.60	8.25	39.16	2.28	53.11	73.9	20.7	150	0	-
Vert.	50.945	QP	39.73	10.82	7.28	31.90	0.00	25.93	40.0	14.0	100	104	-
Vert.	143.896	QP	32.71	14.52	8.53	31.83	0.00	23.93	43.5	19.5	256	90	-
Vert.	191.809	QP	28.29	16.41	8.80	31.79	0.00	21.71	43.5	21.7	100	275	-
Vert.	227.711	QP	38.11	11.42	5.94	31.74	0.00	23.73	46.0	22.2	100	335	-
Vert.	323.647	QP	36.20	14.54	6.65	31.66	0.00	25.73	46.0	20.2	129	207	-
Vert.	539.362	QP	31.14	17.86	7.96	31.64	0.00	25.32	46.0	20.6	100	110	-
Vert.	1441.200	PK	52.44	25.66	13.18	38.92	2.28	54.64	73.9	19.2	380	20	-
Vert.	2378.045	PK	45.68	28.60	14.15	38.73	2.28	51.98	73.9	21.9	107	66	-
Vert.	2390.000	PK	45.56	28.58	14.16	38.72	2.28	51.86	73.9	22.0	107	66	-
Vert.	3843.181	PK	47.89	30.43	6.24	38.21	2.28	48.63	73.9	25.2	204	15	-
Vert.	4804.000	PK	52.19	31.75	6.71	38.55	2.28	54.38	73.9	19.5	131	236	-
Vert.	7206.000	PK	44.79	37.60	8.25	39.16	2.28	53.76	73.9	20.1	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.	1441.200	PK	52.85	25.66	13.18	38.92	-24.71	2.28	30.34	53.9	23.5	*2)
Hori.	2378.062	PK	45.79	28.60	14.15	38.73	-24.71	2.28	27.38	53.9	26.5	*2)
Hori.	2390.000	PK	45.39	28.58	14.16	38.72	-24.71	2.28	26.98	53.9	26.9	*1)
Hori.	3843.181	PK	49.42	30.43	6.24	38.21	-24.71	2.28	25.45	53.9	28.4	*2)
Hori.	4804.000	PK	53.62	31.75	6.71	38.55	-24.71	2.28	31.10	53.9	22.8	-
Hori.	7206.000	PK	44.14	37.60	8.25	39.16	-24.71	2.28	28.40	53.9	25.5	-
Vert.	1441.200	PK	52.44	25.66	13.18	38.92	-24.71	2.28	29.93	53.9	23.9	*2)
Vert.	2378.045	PK	45.68	28.60	14.15	38.73	-24.71	2.28	27.27	53.9	26.6	*2)
Vert.	2390.000	PK	45.56	28.58	14.16	38.72	-24.71	2.28	27.15	53.9	26.7	*1)
Vert.	3843.181	PK	47.89	30.43	6.24	38.21	-24.71	2.28	23.92	53.9	29.9	*2)
Vert.	4804.000	PK	52.19	31.75	6.71	38.55	-24.71	2.28	29.67	53.9	24.2	-
Vert.	7206.000	PK	44.79	37.60	8.25	39.16	-24.71	2.28	29.05	53.9	24.8	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet of Report No.13473127S-A-R2.

*1) Not out of band emission (Leakage Power)

*2) These point are the same duty cycle as carrier.

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	98.47	28.56	14.18	38.72	2.28	104.77	-	-	Carrier
Hori.	2400.000	PK	42.02	28.56	14.17	38.72	2.28	48.31	84.7	36.3	-
Vert.	2402.000	PK	97.17	28.56	14.18	38.72	2.28	103.47	-	-	Carrier
Vert.	2400.000	PK	41.89	28.56	14.17	38.72	2.28	48.18	83.4	35.2	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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Shonan EMC Lab.

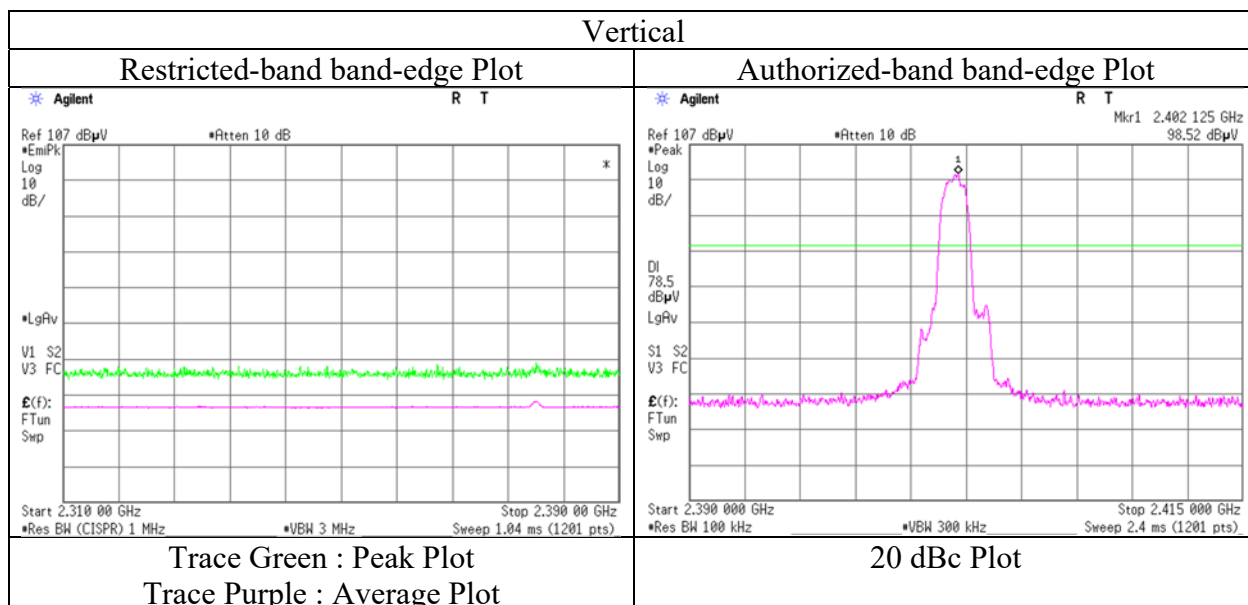
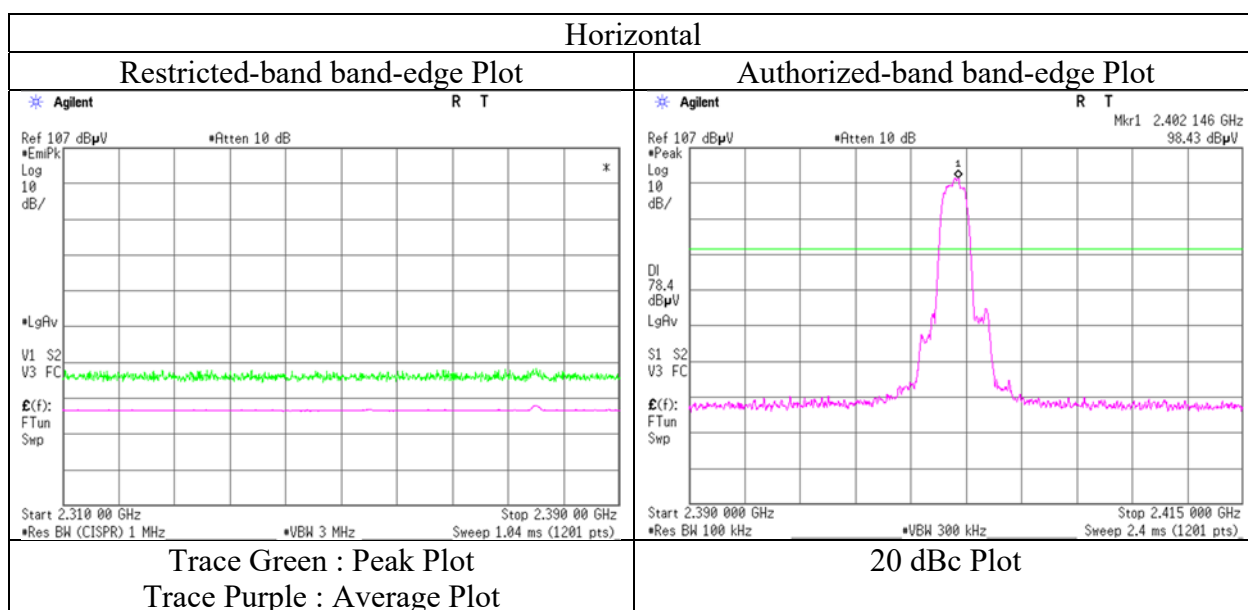
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	14178608S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	February 2, 2022
Temperature / Humidity	22 deg.C, 30 %RH
Engineer	Yusuke Tanikawara
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



* 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.

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Shonan EMC Lab.

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Radiated Spurious Emission

Report No. 14178608S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 2 2 2
Date February 4, 2022 February 2, 2022 February 3, 2022 February 3, 2022
Temperature / Humidity 21 deg.C, 25 %RH 22 deg.C, 30 %RH 21 deg.C, 26 %RH 23 deg.C, 31 %RH
Engineer Miku Ikudome Yusuke Tanikawara Miku Ikudome Yusuke Tanikawara
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz

(* 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.	143.898	QP	41.20	14.52	8.53	31.83	0.00	32.42	43.5	11.0	238	355	-
Hori.	323.652	QP	36.00	14.54	6.65	31.66	0.00	25.53	46.0	20.4	100	338	-
Hori.	551.339	QP	32.20	18.05	8.03	31.65	0.00	26.63	46.0	19.3	100	285	-
Hori.	1464.600	PK	54.88	25.58	13.21	38.92	2.28	57.03	73.9	16.8	177	250	-
Hori.	3905.602	PK	49.71	30.47	6.28	38.20	2.28	50.54	73.9	23.3	154	84	-
Hori.	4882.000	PK	50.48	31.78	6.75	38.59	2.28	52.70	73.9	21.2	146	255	-
Hori.	7323.000	PK	46.61	37.76	8.34	39.22	2.28	55.77	73.9	18.1	129	53	-
Vert.	50.980	QP	39.70	10.81	7.28	31.90	0.00	25.89	40.0	14.1	100	318	-
Vert.	143.888	QP	33.00	14.52	8.53	31.83	0.00	24.22	43.5	19.2	100	257	-
Vert.	203.752	QP	34.50	11.55	5.74	31.77	0.00	20.02	43.5	23.4	100	352	-
Vert.	239.856	QP	42.30	11.69	6.04	31.72	0.00	28.31	46.0	17.6	100	332	-
Vert.	251.786	QP	39.50	11.96	6.13	31.71	0.00	25.88	46.0	20.1	100	295	-
Vert.	323.655	QP	36.00	14.54	6.65	31.66	0.00	25.53	46.0	20.4	135	205	-
Vert.	539.437	QP	31.00	17.86	7.96	31.64	0.00	25.18	46.0	20.8	100	107	-
Vert.	1464.600	PK	53.54	25.58	13.21	38.92	2.28	55.69	73.9	18.2	359	311	-
Vert.	3905.602	PK	48.20	30.47	6.28	38.20	2.28	49.03	73.9	24.8	151	267	-
Vert.	4882.000	PK	51.15	31.78	6.75	38.59	2.28	53.37	73.9	20.5	132	82	-
Vert.	7323.000	PK	45.73	37.76	8.34	39.22	2.28	54.89	73.9	19.0	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.	1464.600	PK	54.88	25.58	13.21	38.92	-24.71	2.28	32.32	53.9	21.5	*1)
Hori.	3905.602	PK	49.71	30.47	6.28	38.20	-24.71	2.28	25.83	53.9	28.0	*1)
Hori.	4882.000	PK	50.48	31.78	6.75	38.59	-24.71	2.28	27.99	53.9	25.9	-
Hori.	7323.000	PK	46.61	37.76	8.34	39.22	-24.71	2.28	31.06	53.9	22.8	-
Vert.	1464.600	PK	53.54	25.58	13.21	38.92	-24.71	2.28	30.98	53.9	22.9	*1)
Vert.	3905.602	PK	48.20	30.47	6.28	38.20	-24.71	2.28	24.32	53.9	29.5	*1)
Vert.	4882.000	PK	51.15	31.78	6.75	38.59	-24.71	2.28	28.66	53.9	25.2	-
Vert.	7323.000	PK	45.73	37.76	8.34	39.22	-24.71	2.28	30.18	53.9	23.7	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.90\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet of Report No.13473127S-A-R2.

*1) These point are the same duty cycle as carrier.

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Radiated Spurious Emission

Report No. 14178608S-B-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2 2 2 2
Date February 4, 2022 February 2, 2022 February 3, 2022 February 3, 2022
Temperature / Humidity 21 deg.C, 25 %RH 22 deg.C, 30 %RH 21 deg.C, 26 %RH 23 deg.C, 31 %RH
Engineer Miku Ikudome Yusuke Tanikawara Miku Ikudome Yusuke Tanikawara
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode Tx, Hopping Off, 3DH5 2480 MHz

(* 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.	143.900	QP	41.30	14.53	8.53	31.83	0.00	32.53	43.5	10.9	228	356	-
Hori.	251.822	QP	35.90	11.96	6.13	31.71	0.00	22.28	46.0	23.7	163	78	-
Hori.	395.602	QP	34.40	15.83	7.10	31.64	0.00	25.69	46.0	20.3	100	3	-
Hori.	407.613	QP	32.00	16.07	7.18	31.64	0.00	23.61	46.0	22.3	100	5	-
Hori.	539.469	QP	33.30	17.86	7.96	31.64	0.00	27.48	46.0	18.5	100	287	-
Hori.	1488.000	PK	57.59	25.53	13.24	38.91	2.28	59.73	73.9	14.1	145	246	-
Hori.	2483.500	PK	48.76	28.47	14.26	38.67	2.28	55.10	73.9	18.8	198	54	-
Hori.	3967.995	PK	50.47	30.49	6.31	38.20	2.28	51.35	73.9	22.5	128	85	-
Hori.	4960.000	PK	52.34	32.03	6.81	38.62	2.28	54.84	73.9	19.0	144	69	-
Hori.	7440.000	PK	47.11	37.82	8.42	39.28	2.28	56.35	73.9	17.5	103	35	-
Vert.	50.971	QP	40.20	10.81	7.28	31.90	0.00	26.39	40.0	13.6	100	65	-
Vert.	143.907	QP	32.80	14.53	8.53	31.83	0.00	24.03	43.5	19.4	100	278	-
Vert.	239.828	QP	42.50	11.69	6.04	31.72	0.00	28.51	46.0	17.4	100	320	-
Vert.	263.792	QP	36.50	12.55	6.22	31.70	0.00	23.57	46.0	22.4	100	315	-
Vert.	299.665	QP	31.90	13.73	6.47	31.69	0.00	20.41	46.0	25.5	154	189	-
Vert.	1488.000	PK	54.68	25.53	13.24	38.91	2.28	56.82	73.9	17.0	337	182	-
Vert.	2483.500	PK	48.31	28.47	14.26	38.67	2.28	54.65	73.9	19.2	142	284	-
Vert.	3967.995	PK	48.88	30.49	6.31	38.20	2.28	49.76	73.9	24.1	153	266	-
Vert.	4960.000	PK	51.39	32.03	6.81	38.62	2.28	53.89	73.9	20.0	161	71	-
Vert.	7440.000	PK	45.17	37.82	8.42	39.28	2.28	54.41	73.9	19.4	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 (3.90 m / 3.0 m) = 2.28 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.	1488.000	PK	57.59	25.53	13.24	38.91	-24.71	2.28	35.02	53.9	18.8	*2)
Hori.	2483.500	PK	48.76	28.47	14.26	38.67	-24.71	2.28	30.39	53.9	23.5	*1)
Hori.	3967.995	PK	50.47	30.49	6.31	38.20	-24.71	2.28	26.64	53.9	27.2	*2)
Hori.	4960.000	PK	52.34	32.03	6.81	38.62	-24.71	2.28	30.13	53.9	23.7	-
Hori.	7440.000	PK	47.11	37.82	8.42	39.28	-24.71	2.28	31.64	53.9	22.2	-
Vert.	1488.000	PK	54.68	25.53	13.24	38.91	-24.71	2.28	32.11	53.9	21.7	*2)
Vert.	2483.500	PK	48.31	28.47	14.26	38.67	-24.71	2.28	29.94	53.9	23.9	*1)
Vert.	3967.995	PK	48.88	30.49	6.31	38.20	-24.71	2.28	25.05	53.9	28.8	*2)
Vert.	4960.000	PK	51.39	32.03	6.81	38.62	-24.71	2.28	29.18	53.9	24.7	-
Vert.	7440.000	PK	45.17	37.82	8.42	39.28	-24.71	2.28	29.70	53.9	24.2	-

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

Distance factor : 1 GHz - 10 GHz : 20log (3.90 m / 3.0 m) = 2.28 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 of Report No.13473127S-A-R2.

*1) Not out of band emission (Leakage Power)

*2) These point are the same duty cycle as carrier.

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Shonan EMC Lab.

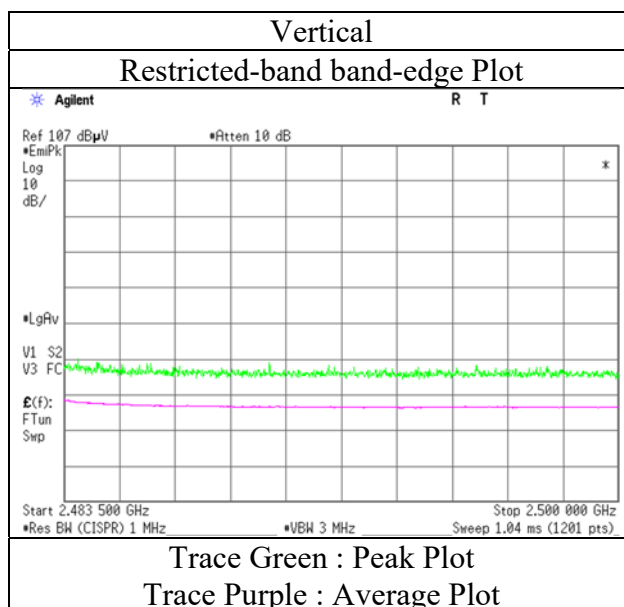
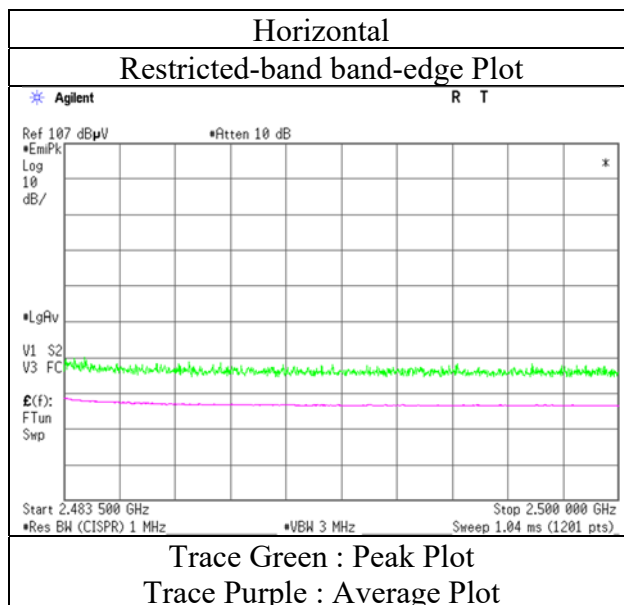
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Radiated Spurious Emission (Reference Plot for band-edge)

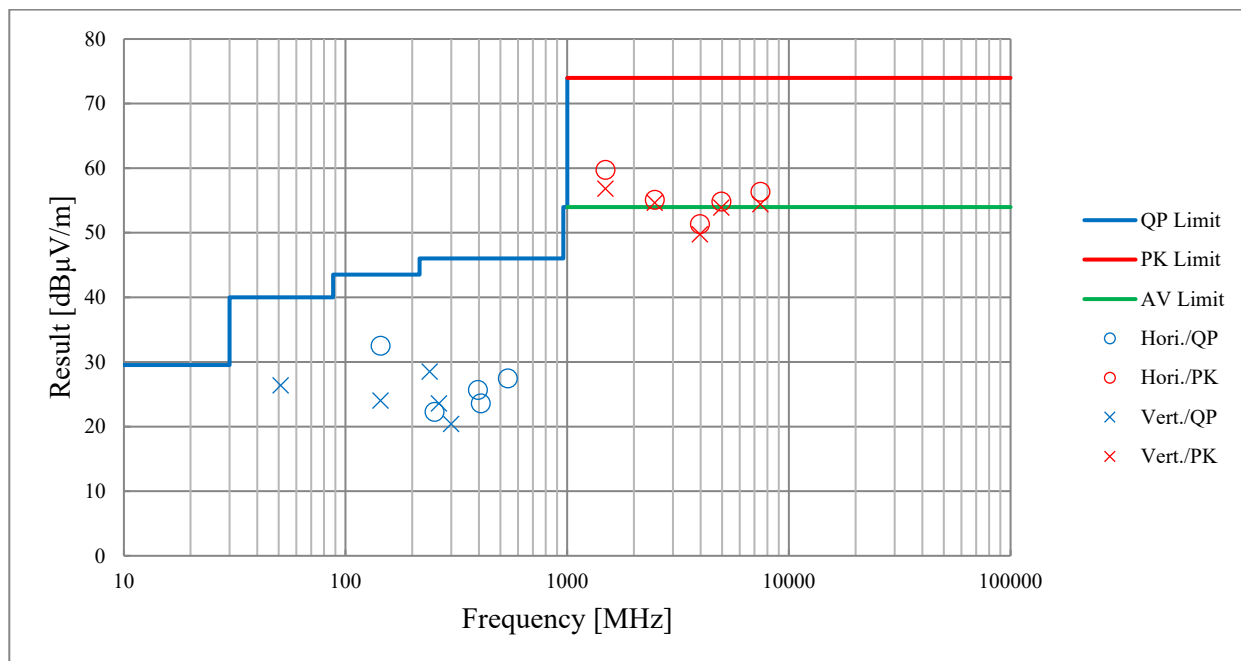
Report No.	14178608S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	February 2, 2022
Temperature / Humidity	22 deg.C, 30 %RH
Engineer	Yusuke Tanikawara (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



* 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)

Report No.	14178608S-B-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	February 4, 2022	February 2, 2022	February 3, 2022	February 3, 2022
Temperature / Humidity	21 deg.C, 25 %RH	22 deg.C, 30 %RH	21 deg.C, 26 %RH	23 deg.C, 31 %RH
Engineer	Miku Ikudome	Yusuke Tanikawara	Miku Ikudome	Yusuke Tanikawara
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz			



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

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2021/10/13	12
RE	SAEC-02(NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2021/03/16	12
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2021/05/20	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2022/02/24	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2021/05/17	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	SAT3-16	175905	Attenuator	JFW	50HF-003N	-	2021/12/10	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2022/02/21	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032665	2021/04/10	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141P E/141PE/141PE/141P E/NS4906	-/0901-270(RF Selector)	2021/04/12	12
RE	SCC-B2/B4/B6/B7/B8/B13/SRSE-02	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141P E/141PE/141PE/141P E/NS4906	-/0901-270(RF Selector)	2021/04/12	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2021/03/01	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2022/01/06	12
RE	SCC-G50	178573	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	MY13407/4E	2021/03/01	12
RE	SCC-G51	178572	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800288 /4A	2021/03/01	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2021/05/18	12
RE	SCC-G69	200009	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575617/4	2021/07/06	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2021/10/07	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-726	2021/06/14	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2021/06/14	12
RE	SHA-09	194684	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	695	2021/03/03	12
RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2021/04/10	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2021/09/17	12
RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2021/04/28	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

UL Japan, Inc.

Shonan EMC Lab.

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