



Test report No.
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FCC ID

: 13994981S-H-R1
: 1 of 30
: February 22, 2022
: YR7SKR3000P8

RADIO TEST REPORT

Test Report No. : 13994981S-H-R1

Applicant : KONICA MINOLTA, INC.
Type of EUT : SKR 3000
Model Number of EUT : P-85
FCC ID : YR7SKR3000P8
Test regulation : FCC Part 15 Subpart C: 2021
Test item : Radiated Spurious Emission
Test result : Complied (Refer to SECTION 3)

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4. The test results in this test report are traceable to the national or international standards.
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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 13994981S-H. 13994981S-H is replaced with this report.

Date of test: November 18 to December 1, 2021

Representative test engineer:

Akihiro Oda
Engineer

Approved by:

Toyokazu Imamura
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.: 13994981S-H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13994981S-H	January 19, 2022	-	-
1	13994981S-H-R1	February 22, 2022	6	Addition of Conducted Emission in 3.2

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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 : KONICA MINOLTA, INC.
 Address : 1, Sakura-machi, Hino-shi, Tokyo, Japan 191-8511
 Telephone Number : +81-42-589-8429
 Contact Person : Yukihiro Niekawa

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 : SKR 3000
 Model Number : P-85
 Serial Number : Refer to SECTION 4.2
 Receipt Date : September 22, 2021
 Condition : Production prototype
 (Not for Sale: This sample is equivalent to mass-produced items.)
 Modification : No Modification by the test lab.

2.2 Product Description

Model: P-85 (referred to as the EUT in this report) is SKR 3000.

General Specification

Rating : DC 15 V

Radio Specification

Equipment Type : Transceiver
 Operating Temperature : 10 deg. C to 35 deg. C

	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	2412 MHz - 2462 MHz 5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM,QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel spacing	5 MHz		20 MHz	5 MHz (2.4 GHz band) 20 MHz (5 GHz band)	40 MHz
Antenna Type	[Main Antenna (chain 0)/Sub Antenna(chain 1)]PIFA (Planar Inverted F Antenna)				
Antenna gain	[Main Antenna (chain 0)] -1.95 dBi (2.4 GHz Band), -0.98 dBi (5 GHz Band)				
	[Sub Antenna (chain 1)] -2.21 dBi (2.4 GHz Band), -1.54 dBi (5 GHz Band)				
Antenna Connector type	[Main Antenna (chain0)/Sub Antenna(chain 1)] Connector PCB side: ULF, Antenna side: Soldered				

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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

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

Following test items were performed in this report (See clause 3.2). The rest of the test items required were conducted with wireless module SX-SDMAN2. Refer to the test report 13568152S-K.

* For test report(s) referred in this report, the latest version (including any revisions) is always referred.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 ISED: RSS-Gen 8.8	FCC: 15.407 (b) (6) / 15.207 ISED: RSS-Gen 8.8	-	N/A	*1)
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.3 dB 2390.000 MHz, AV, Vertical, Mode: Tx 11n-20 2412 MHz	Complied a)	Radiated (above 30 MHz) *2)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT has no AC mains. Wireless LAN does not operate during charging. *2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.					
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)

This EUT provides the stable voltage constantly to RF Module regardless of input voltage. Therefore, this 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

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
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)

Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009 and also was judged the necessity of 802.11ac mode by the pre-test.

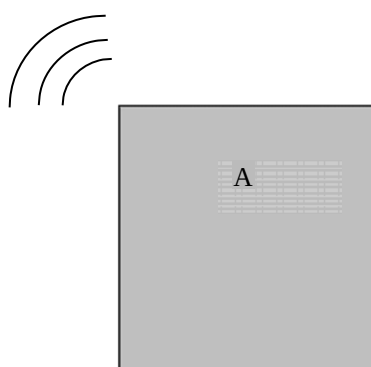
Mode	Remarks*	Power Setting (dBm)
IEEE 802.11b (11b)	11 Mbps, PN9	14
IEEE 802.11g (11g)	36 Mbps, PN9	8, 15, 11
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 12 (Long GI), PN9	6, 14, 7
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) (Reference test report No.: Refer to 3.1)		
*Power of the EUT was set by the software as follows; - Software: Refer to the below table.		
*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.		

Software name	Version	Released Date	Storage location
Panel Firmware	V4.10R00.001	2021/6/8	EUT memory (*. operated by connected host PC)
Wlan Auth Tool	1.3.0	2016/7/13	Connected host PC

*The details of Operating mode(s)

Test Item	Operating Mode	Tested Antenna	Tested frequency
Spurious Emission	11b Tx 11g Tx	Sub	2412 MHz 2437 MHz 2462 MHz
	11n-20 (MIMO) Tx	Main + Sub	2412 MHz 2437 MHz 2462 MHz

4.2 Configuration and peripherals



Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	SKR 3000	P-85	ADU0-S0001	KONICA MINOLTA INC.	EUT

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SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[For below 1 GHz]

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.
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.

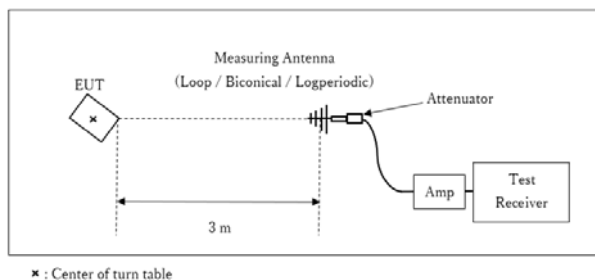
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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	11.12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on ANSI C63.10-2013.

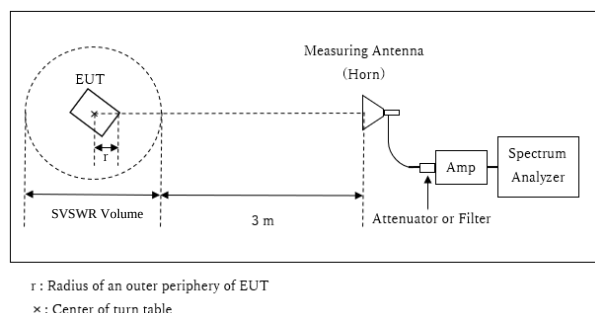
Figure 1: Test Setup

Below 1 GHz



Test Distance: 3 m

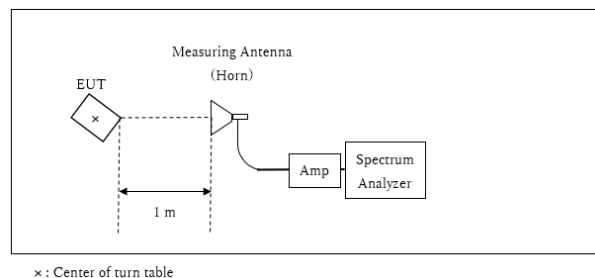
1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.81 \text{ m} / 3.0 \text{ m}) = 2.08 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.81 \text{ m}$

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.19 \text{ m}$

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.

11b, 11g

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	-	X	Y	X	X
Vertical	X	-	X	X	X	X

11n-20 (MIMO)

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	X	Y	Z	X	X
Vertical	X	X	X	X	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

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APPENDIX 1: Test data

Radiated Spurious Emission

Report No.	13994981S-H-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	November 18, 2021
Temperature / Humidity	21 deg.C, 36 %RH
Engineer	Yohsuke Matsuzawa
Mode	Tx 11b 2412 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	45.42	28.58	14.18	38.72	2.08	51.54	73.9	22.3	149	334	-
Hori.	4824.000	PK	47.57	31.77	6.63	38.56	2.08	49.49	73.9	24.4	174	105	-
Hori.	7236.000	PK	45.35	37.63	8.05	39.18	2.08	53.93	73.9	19.9	150	0	-
Hori.	9648.000	PK	44.85	39.10	9.32	39.71	2.08	55.64	73.9	18.2	150	0	-
Hori.	7236.000	AV	35.83	37.63	8.05	39.18	2.08	44.41	53.9	9.4	150	0	Floor noise
Hori.	9648.000	AV	35.86	39.10	9.32	39.71	2.08	46.65	53.9	7.2	150	0	Floor noise
Vert.	2390.000	PK	45.58	28.58	14.18	38.72	2.08	51.70	73.9	22.2	234	258	-
Vert.	4824.000	PK	49.69	31.77	6.63	38.56	2.08	51.61	73.9	22.2	113	77	-
Vert.	7236.000	PK	44.67	37.63	8.05	39.18	2.08	53.25	73.9	20.6	150	0	-
Vert.	9648.000	PK	45.16	39.10	9.32	39.71	2.08	55.95	73.9	17.9	150	0	-
Vert.	7236.000	AV	35.94	37.63	8.05	39.18	2.08	44.52	53.9	9.3	150	0	Floor noise
Vert.	9648.000	AV	36.02	39.10	9.32	39.71	2.08	46.81	53.9	7.0	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	35.46	28.58	14.18	38.72	0.33	2.08	41.91	53.9	11.9	*1)
Hori.	4824.000	AV	39.29	31.77	6.63	38.56	0.33	2.08	41.54	53.9	12.3	-
Vert.	2390.000	AV	36.38	28.58	14.18	38.72	0.33	2.08	42.83	53.9	11.0	*1)
Vert.	4824.000	AV	40.88	31.77	6.63	38.56	0.33	2.08	43.13	53.9	10.7	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet ($20\log(1.334 / 1.285) = 0.33\text{ dB}$: Test report 13568152S-K).

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	85.42	28.54	14.20	38.71	2.08	91.53	-	-	Carrier
Hori.	2400.000	PK	45.65	28.56	14.19	38.72	2.08	51.76	71.5	19.7	-
Vert.	2412.000	PK	87.41	28.54	14.20	38.71	2.08	93.52	-	-	Carrier
Vert.	2400.000	PK	47.44	28.56	14.19	38.72	2.08	53.55	73.5	19.9	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

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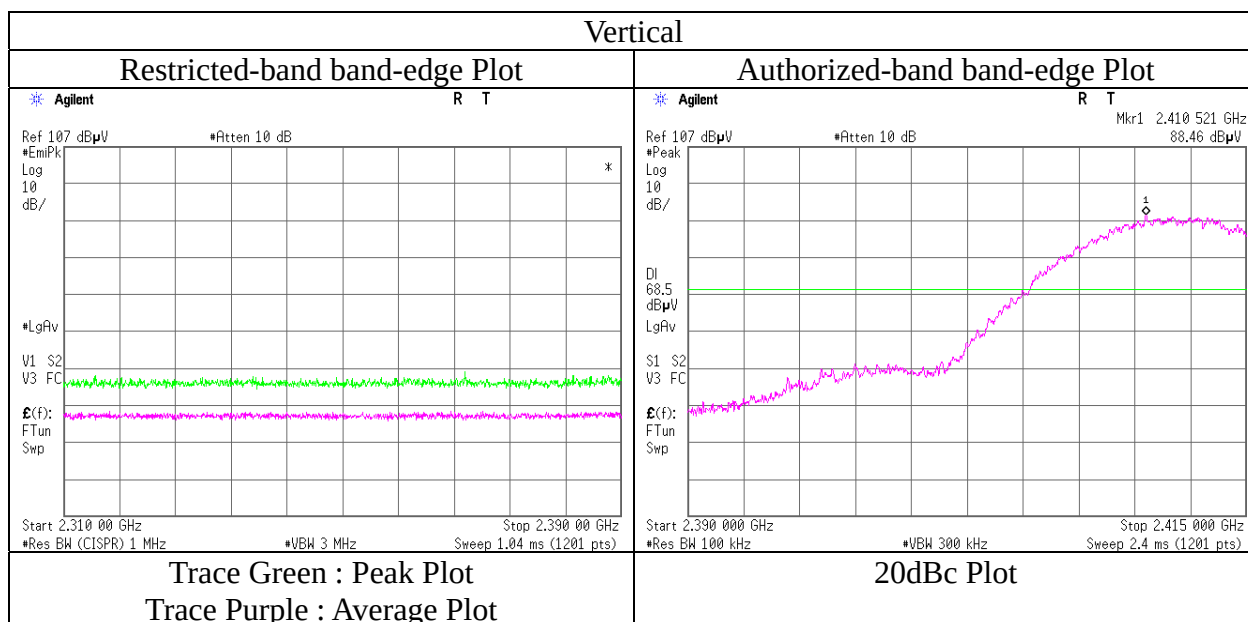
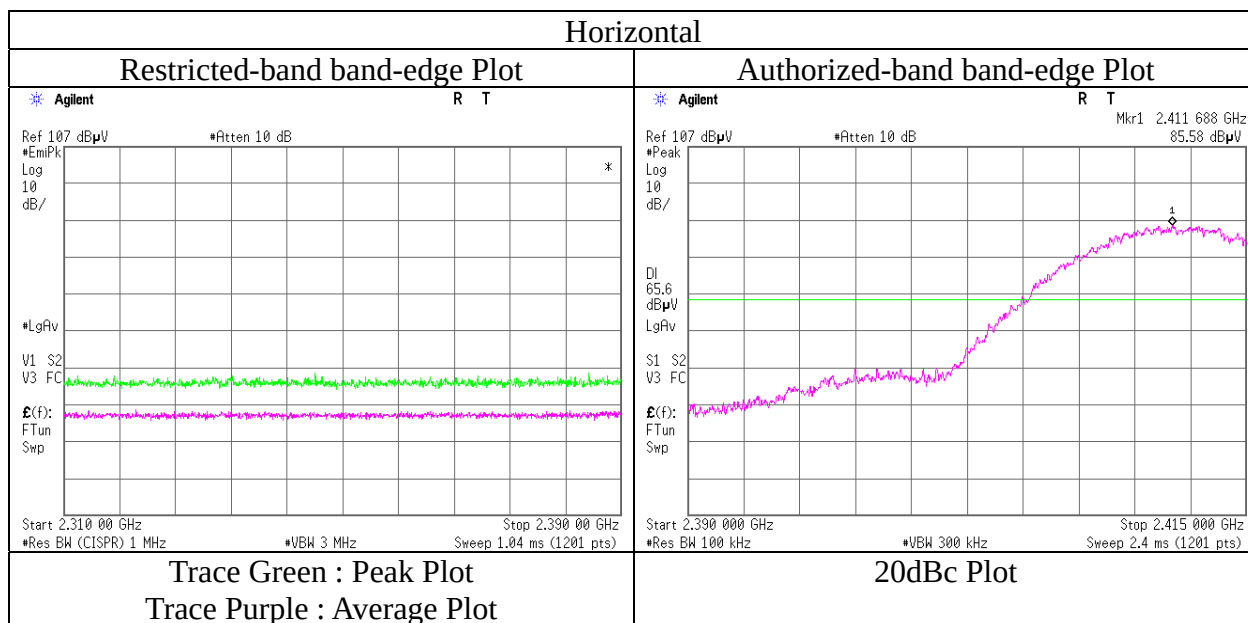
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No. 13994981S-H-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date November 18, 2021
Temperature / Humidity 21 deg.C, 36 %RH
Engineer Yohsuke Matsuzawa
Mode Tx 11b 2412 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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Facsimile : +81 463 50 6401

Radiated Spurious Emission

Report No.	13994981S-H-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	2
Date	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	21 deg.C, 36 %RH	22 deg.C, 39 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yohsuke Matsuzawa	Akihiro Oda	Miku Ikudome	Shunsaku Yumi
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11b 2437 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.	4874.000	PK	47.09	31.77	6.65	38.58	2.08	49.01	73.9	24.8	155	114	-
Hori.	7311.000	PK	45.79	37.73	8.10	39.22	2.08	54.48	73.9	19.4	150	0	-
Hori.	9748.000	PK	44.36	39.40	9.36	39.73	2.08	55.47	73.9	18.4	150	0	-
Hori.	7311.000	AV	35.69	37.73	8.10	39.22	2.08	44.38	53.9	9.5	150	0	Floor noise
Hori.	9748.000	AV	36.11	39.40	9.36	39.73	2.08	47.22	53.9	6.6	150	0	Floor noise
Vert.	4874.000	PK	47.08	31.77	6.65	38.58	2.08	49.00	73.9	24.9	156	95	-
Vert.	7311.000	PK	44.58	37.73	8.10	39.22	2.08	53.27	73.9	20.6	150	0	-
Vert.	9748.000	PK	44.37	39.40	9.36	39.73	2.08	55.48	73.9	18.4	150	0	-
Vert.	7311.000	AV	35.87	37.73	8.10	39.22	2.08	44.56	53.9	9.3	150	0	Floor noise
Vert.	9748.000	AV	35.98	39.40	9.36	39.73	2.08	47.09	53.9	6.8	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	38.01	31.77	6.65	38.58	0.33	2.08	40.26	53.9	13.6	-
Vert.	4874.000	AV	38.12	31.77	6.65	38.58	0.33	2.08	40.37	53.9	13.5	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet ($20\log(1.334 / 1.285) = 0.33\text{ dB}$: Test report 13568152S-K).

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Shonan EMC Lab.

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Radiated Spurious Emission

Report No.	13994981S-H-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	2
Date	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	21 deg.C, 36 %RH	22 deg.C, 39 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yohsuke Matsuzawa (1 GHz -2.8 GHz)	Akihiro Oda (2.8 GHz -10 GHz)	Miku Ikudome (10 GHz -18 GHz)	Shunsaku Yumi (18 GHz -26.5 GHz)
Mode	Tx 11b 2462 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	45.17	28.47	14.28	38.67	2.08	51.33	73.9	22.5	161	333	-
Hori.	4924.000	PK	46.97	31.89	6.69	38.61	2.08	49.02	73.9	24.8	160	114	-
Hori.	7386.000	PK	45.63	37.82	8.13	39.25	2.08	54.41	73.9	19.4	150	0	-
Hori.	9848.000	PK	45.23	39.55	9.41	39.75	2.08	56.52	73.9	17.3	150	0	-
Hori.	7386.000	AV	35.45	37.82	8.13	39.25	2.08	44.23	53.9	9.6	150	0	Floor noise
Hori.	9848.000	AV	35.79	39.55	9.41	39.75	2.08	47.08	53.9	6.8	150	0	Floor noise
Vert.	2483.500	PK	45.03	28.47	14.28	38.67	2.08	51.19	73.9	22.7	338	259	-
Vert.	4924.000	PK	46.70	31.89	6.69	38.61	2.08	48.75	73.9	25.1	159	90	-
Vert.	7386.000	PK	44.18	37.82	8.13	39.25	2.08	52.96	73.9	20.9	150	0	-
Vert.	9848.000	PK	44.35	39.55	9.41	39.75	2.08	55.64	73.9	18.2	150	0	-
Vert.	7386.000	AV	35.78	37.82	8.13	39.25	2.08	44.56	53.9	9.3	150	0	Floor noise
Vert.	9848.000	AV	35.62	39.55	9.41	39.75	2.08	46.91	53.9	6.9	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	35.89	28.47	14.28	38.67	0.33	2.08	42.38	53.9	11.5	*1)
Hori.	4924.000	AV	37.30	31.89	6.69	38.61	0.33	2.08	39.68	53.9	14.2	-
Vert.	2483.500	AV	35.67	28.47	14.28	38.67	0.33	2.08	42.16	53.9	11.7	*1)
Vert.	4924.000	AV	37.73	31.89	6.69	38.61	0.33	2.08	40.11	53.9	13.7	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet ($20\log(1.334 / 1.285) = 0.33\text{ dB}$: Test report 13568152S-K).

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

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Shonan EMC Lab.

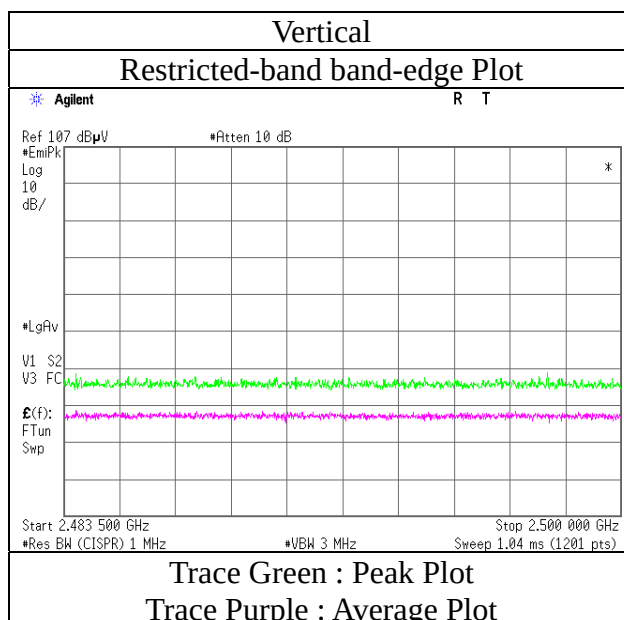
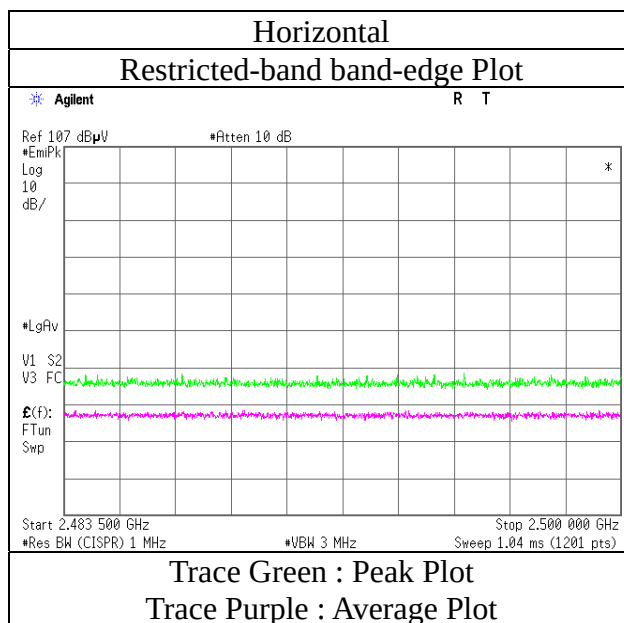
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No. 13994981S-H-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date November 18, 2021
Temperature / Humidity 21 deg.C, 36 %RH
Engineer Yohsuke Matsuzawa
Mode Tx 11b 2462 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

Report No.	13994981S-H-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	2
Date	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	21 deg.C, 36 %RH	22 deg.C, 39 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yohsuke Matsuzawa	Akihiro Oda	Miku Ikudome	Shunsaku Yumi
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11g 2412 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	49.28	28.58	14.18	38.72	2.08	55.40	73.9	18.5	178	333	-
Hori.	4824.000	PK	44.19	31.77	6.63	38.56	2.08	46.11	73.9	27.7	168	119	-
Hori.	7236.000	PK	45.38	37.63	8.05	39.18	2.08	53.96	73.9	19.9	150	0	-
Hori.	9648.000	PK	44.42	39.10	9.32	39.71	2.08	55.21	73.9	18.6	150	0	-
Hori.	7236.000	AV	35.79	37.63	8.05	39.18	2.08	44.37	53.9	9.5	150	0	Floor noise
Hori.	9648.000	AV	36.11	39.10	9.32	39.71	2.08	46.90	53.9	7.0	150	0	Floor noise
Vert.	2390.000	PK	51.45	28.58	14.18	38.72	2.08	57.57	73.9	16.3	236	260	-
Vert.	4824.000	PK	43.74	31.77	6.63	38.56	2.08	45.66	73.9	28.2	142	13	-
Vert.	7236.000	PK	44.31	37.63	8.05	39.18	2.08	52.89	73.9	21.0	150	0	-
Vert.	9648.000	PK	45.31	39.10	9.32	39.71	2.08	56.10	73.9	17.8	150	0	-
Vert.	7236.000	AV	35.89	37.63	8.05	39.18	2.08	44.47	53.9	9.4	150	0	Floor noise
Vert.	9648.000	AV	35.99	39.10	9.32	39.71	2.08	46.78	53.9	7.1	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	37.21	28.58	14.18	38.72	1.25	2.08	44.58	53.9	9.3	*1)
Hori.	4824.000	AV	35.52	31.77	6.63	38.56	1.25	2.08	38.69	53.9	15.2	-
Vert.	2390.000	AV	38.97	28.58	14.18	38.72	1.25	2.08	46.34	53.9	7.5	*1)
Vert.	4824.000	AV	35.33	31.77	6.63	38.56	1.25	2.08	38.50	53.9	15.4	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet ($20\log(0.414 / 0.358) = 1.25\text{ dB}$: Test report 13568152S-K).

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	77.29	28.54	14.20	38.71	2.08	83.40	-	-	Carrier
Hori.	2400.000	PK	49.31	28.56	14.19	38.72	2.08	55.42	63.4	7.9	-
Vert.	2412.000	PK	79.33	28.54	14.20	38.71	2.08	85.44	-	-	Carrier
Vert.	2400.000	PK	50.85	28.56	14.19	38.72	2.08	56.96	65.4	8.4	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

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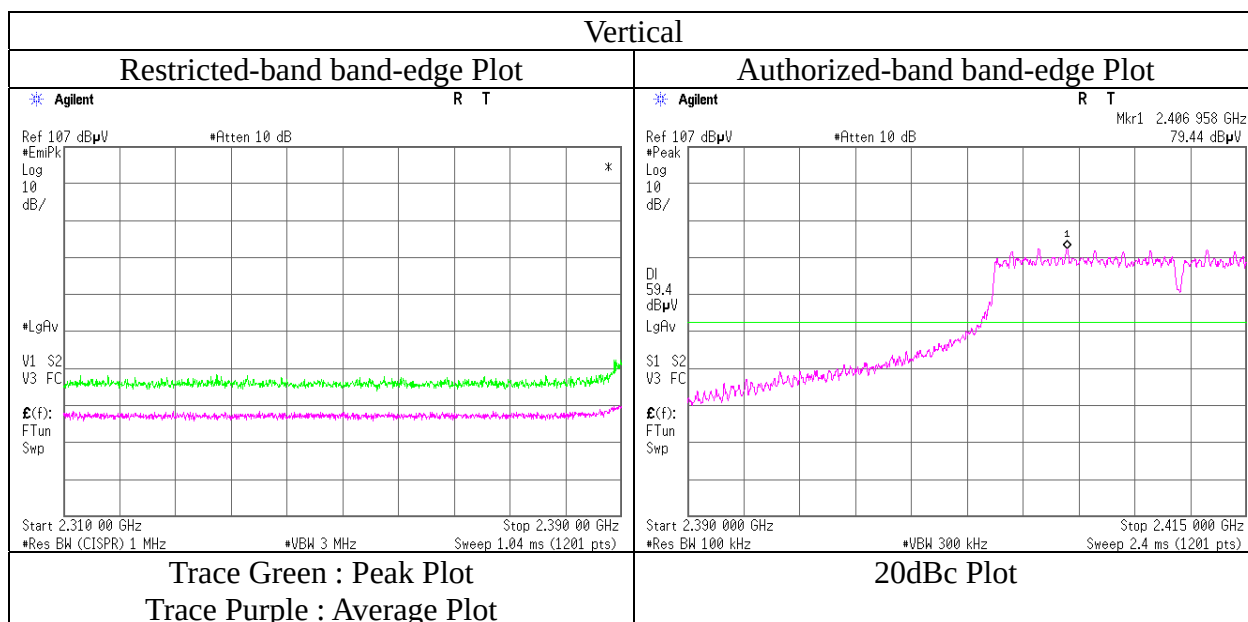
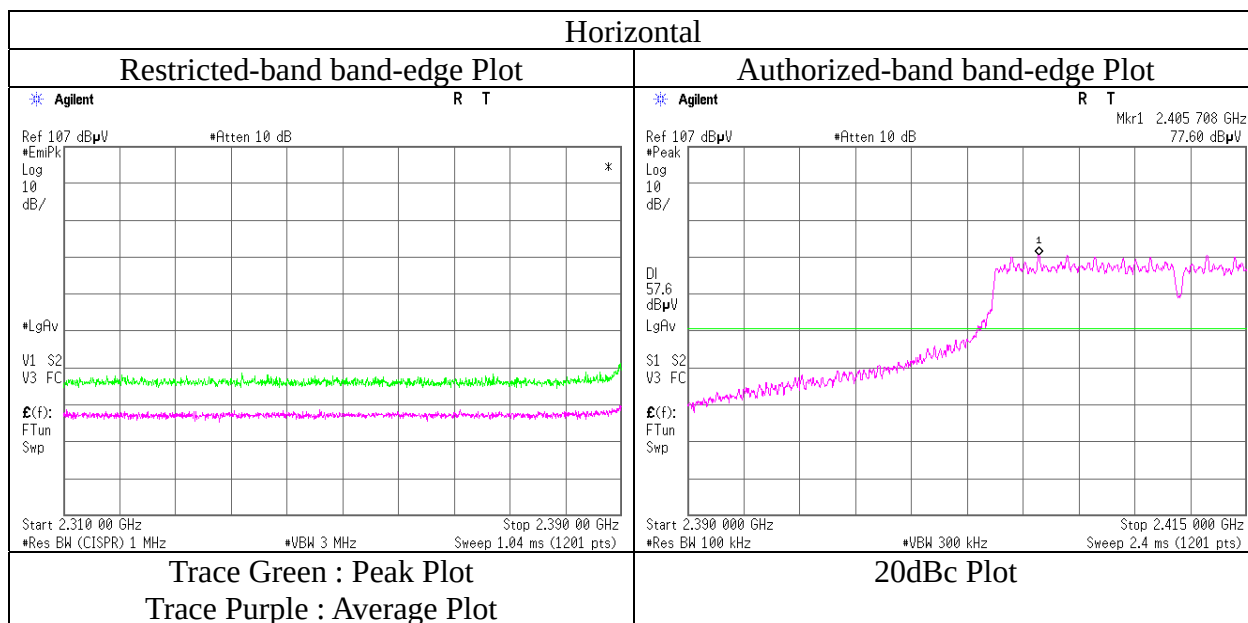
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13994981S-H-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	November 18, 2021
Temperature / Humidity	21 deg.C, 36 %RH
Engineer	Yohsuke Matsuzawa
Mode	Tx 11g 2412 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.	13994981S-H-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	2
Date	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	21 deg.C, 36 %RH	22 deg.C, 39 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yohsuke Matsuzawa	Akihiro Oda	Miku Ikudome	Shunsaku Yumi
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11g 2437 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.	4874.000	PK	44.56	31.77	6.65	38.58	2.08	46.48	73.9	27.4	152	98	-
Hori.	7311.000	PK	45.11	37.73	8.10	39.22	2.08	53.80	73.9	20.1	150	0	-
Hori.	9748.000	PK	44.88	39.40	9.36	39.73	2.08	55.99	73.9	17.9	150	0	-
Hori.	7311.000	AV	36.09	37.73	8.10	39.22	2.08	44.78	53.9	9.1	150	0	Floor noise
Hori.	9748.000	AV	35.86	39.40	9.36	39.73	2.08	46.97	53.9	6.9	150	0	Floor noise
Vert.	4874.000	PK	44.38	31.77	6.65	38.58	2.08	46.30	73.9	27.6	144	34	-
Vert.	7311.000	PK	44.78	37.73	8.10	39.22	2.08	53.47	73.9	20.4	150	0	-
Vert.	9748.000	PK	45.15	39.40	9.36	39.73	2.08	56.26	73.9	17.6	150	0	-
Vert.	7311.000	AV	35.71	37.73	8.10	39.22	2.08	44.40	53.9	9.5	150	0	Floor noise
Vert.	9748.000	AV	35.96	39.40	9.36	39.73	2.08	47.07	53.9	6.8	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	35.72	31.77	6.65	38.58	1.25	2.08	38.89	53.9	15.0	-
Vert.	4874.000	AV	35.29	31.77	6.65	38.58	1.25	2.08	38.46	53.9	15.4	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet ($20\log(0.414 / 0.358) = 1.25\text{ dB}$: Test report 13568152S-K).

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Radiated Spurious Emission

Report No.	13994981S-H-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	2
Date	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	21 deg.C, 36 %RH	22 deg.C, 39 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yohsuke Matsuzawa	Akihiro Oda	Miku Ikudome	Shunsaku Yumi
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11g 2462 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	50.68	28.47	14.28	38.67	2.08	56.84	73.9	17.0	242	342	-
Hori.	4924.000	PK	44.24	31.89	6.69	38.61	2.08	46.29	73.9	27.6	163	111	-
Hori.	7386.000	PK	44.47	37.82	8.13	39.25	2.08	53.25	73.9	20.6	150	0	-
Hori.	9848.000	PK	44.81	39.55	9.41	39.75	2.08	56.10	73.9	17.8	150	0	-
Hori.	7386.000	AV	35.48	37.82	8.13	39.25	2.08	44.26	53.9	9.6	150	0	Floor noise
Hori.	9848.000	AV	36.11	39.55	9.41	39.75	2.08	47.40	53.9	6.5	150	0	Floor noise
Vert.	2483.500	PK	50.97	28.47	14.28	38.67	2.08	57.13	73.9	16.7	338	255	-
Vert.	4924.000	PK	43.98	31.89	6.69	38.61	2.08	46.03	73.9	27.8	138	33	-
Vert.	7386.000	PK	44.12	37.82	8.13	39.25	2.08	52.90	73.9	21.0	150	0	-
Vert.	9848.000	PK	45.37	39.55	9.41	39.75	2.08	56.66	73.9	17.2	150	0	-
Vert.	7386.000	AV	35.44	37.82	8.13	39.25	2.08	44.22	53.9	9.6	150	0	Floor noise
Vert.	9848.000	AV	36.14	39.55	9.41	39.75	2.08	47.43	53.9	6.4	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	37.92	28.47	14.28	38.67	1.25	2.08	45.33	53.9	8.5	*1)
Hori.	4924.000	AV	35.34	31.89	6.69	38.61	1.25	2.08	38.64	53.9	15.2	-
Vert.	2483.500	AV	38.63	28.47	14.28	38.67	1.25	2.08	46.04	53.9	7.8	*1)
Vert.	4924.000	AV	34.98	31.89	6.69	38.61	1.25	2.08	38.28	53.9	15.6	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

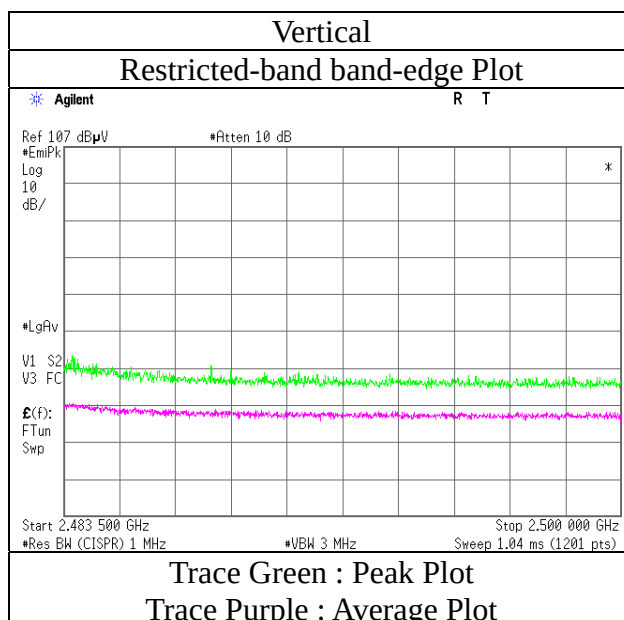
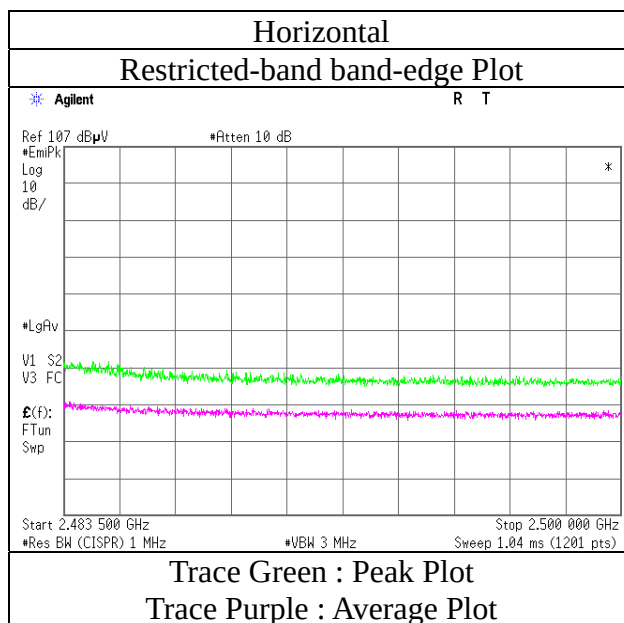
10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Burst rate confirmation" sheet ($20\log(0.414 / 0.358) = 1.25\text{ dB}$: Test report 13568152S-K).

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No. 13994981S-H-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date November 18, 2021
Temperature / Humidity 21 deg.C, 36 %RH
Engineer Yohsuke Matsuzawa
Mode Tx 11g 2462 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

Report No.	13994981S-H-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	2
Date	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	21 deg.C, 36 %RH	22 deg.C, 34 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yohsuke Matsuzawa (1 GHz -2.8 GHz)	Yohsuke Matsuzawa (2.8 GHz -10 GHz)	Miku Ikudome (10 GHz -18 GHz)	Shunsaku Yumi (18 GHz -26.5 GHz)
Mode	Tx 11n-20 2412 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	53.25	28.58	14.18	38.72	2.08	59.37	73.9	14.5	181	118	-
Hori.	4824.000	PK	45.44	31.77	6.63	38.56	2.08	47.36	73.9	26.5	159	282	-
Hori.	7236.000	PK	45.23	37.63	8.05	39.18	2.08	53.81	73.9	20.0	150	0	-
Hori.	9648.000	PK	46.26	39.10	9.32	39.71	2.08	57.05	73.9	16.8	150	0	-
Hori.	7236.000	AV	34.89	37.63	8.05	39.18	2.08	43.47	53.9	10.4	150	0	Floor noise
Hori.	9648.000	AV	35.35	39.10	9.32	39.71	2.08	46.14	53.9	7.7	150	0	Floor noise
Vert.	2390.000	PK	52.33	28.58	14.18	38.72	2.08	58.45	73.9	15.4	349	258	-
Vert.	4824.000	PK	45.11	31.77	6.63	38.56	2.08	47.03	73.9	26.8	151	181	-
Vert.	7236.000	PK	45.67	37.63	8.05	39.18	2.08	54.25	73.9	19.6	150	0	-
Vert.	9648.000	PK	45.60	39.10	9.32	39.71	2.08	56.39	73.9	17.5	150	0	-
Vert.	7236.000	AV	34.99	37.63	8.05	39.18	2.08	43.57	53.9	10.3	150	0	Floor noise
Vert.	9648.000	AV	35.23	39.10	9.32	39.71	2.08	46.02	53.9	7.8	150	0	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	37.68	28.58	14.18	38.72	2.17	2.08	45.97	53.9	7.9	*1)
Hori.	4824.000	AV	34.42	31.77	6.63	38.56	2.17	2.08	38.51	53.9	15.3	-
Vert.	2390.000	AV	38.27	28.58	14.18	38.72	2.17	2.08	46.56	53.9	7.3	*1)
Vert.	4824.000	AV	34.63	31.77	6.63	38.56	2.17	2.08	38.72	53.9	15.1	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet ($20\log(0.253 / 0.1972) = 2.17\text{ dB}$: Test report 13568152S-K).

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	82.61	28.54	14.20	38.71	2.08	88.72	-	-	Carrier
Hori.	2400.000	PK	51.69	28.56	14.19	38.72	2.08	57.80	68.7	10.9	-
Vert.	2412.000	PK	81.48	28.54	14.20	38.71	2.08	87.59	-	-	Carrier
Vert.	2400.000	PK	49.87	28.56	14.19	38.72	2.08	55.98	67.5	11.5	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

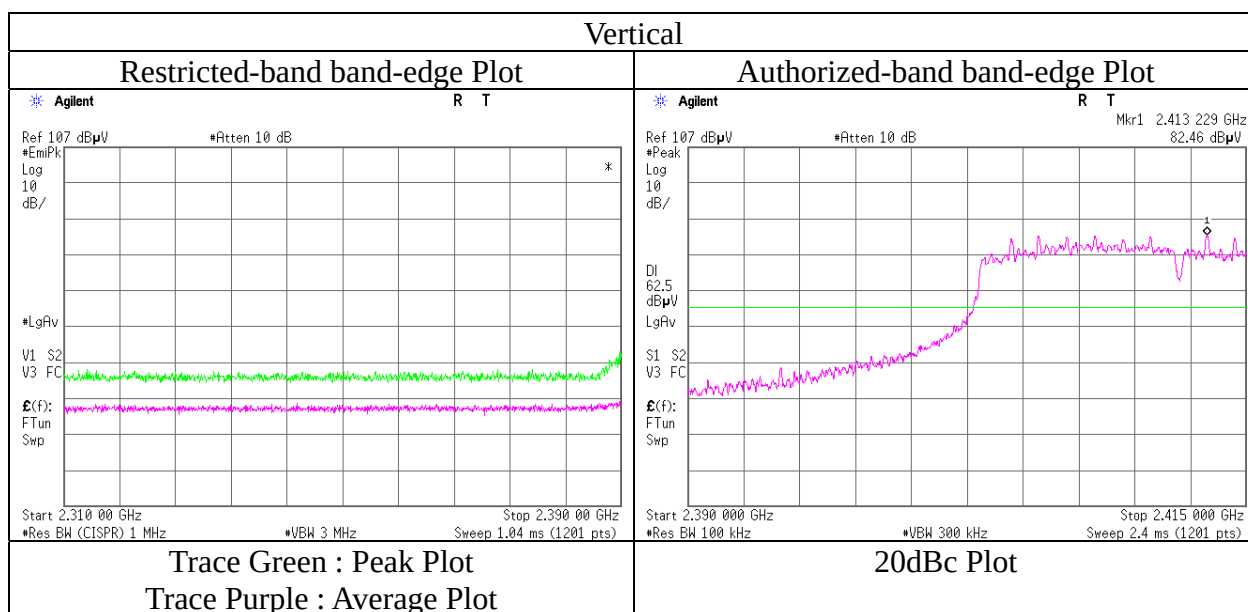
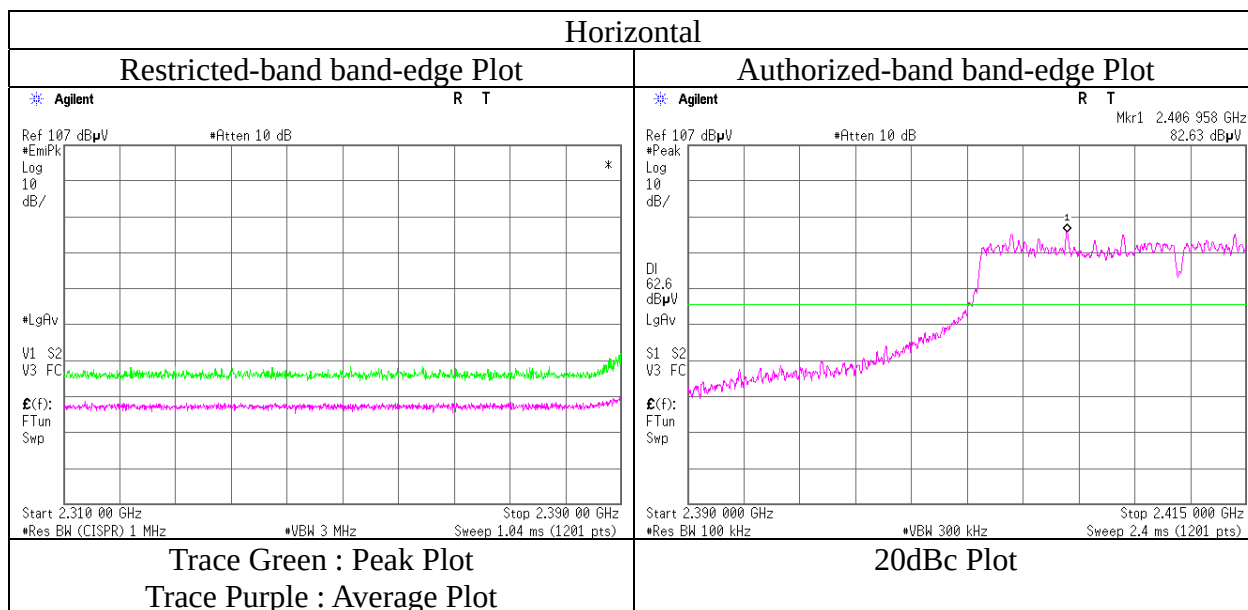
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13994981S-H-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	November 18, 2021
Temperature / Humidity	21 deg.C, 36 %RH
Engineer	Yohsuke Matsuzawa
Mode	Tx 11n-20 2412 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

Report No.	13994981S-H-R1				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	2	2	2	3	2
Date	December 1, 2021	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	22 deg.C, 38 %RH	21 deg.C, 36 %RH	22 deg.C, 34 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yosuke Murakami	Yohsuke Matsuzawa	Yohsuke Matsuzawa	Miku Ikudome	Shunsaku Yumi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11n-20 2437 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.	350.000	QP	29.00	15.25	6.80	31.63	0.00	19.42	46.0	26.5	100	162	-
Hori.	550.000	QP	25.90	18.04	7.99	31.65	0.00	20.28	46.0	25.7	180	4	-
Hori.	850.000	QP	27.40	21.62	9.47	31.13	0.00	27.36	46.0	18.6	108	0	-
Hori.	900.000	QP	28.80	22.11	9.71	30.86	0.00	29.76	46.0	16.2	100	357	-
Hori.	950.000	QP	28.40	22.15	9.95	30.48	0.00	30.02	46.0	15.9	100	348	-
Hori.	1000.000	QP	29.60	22.51	10.18	30.15	0.00	32.14	53.9	21.7	100	351	-
Hori.	4874.000	PK	49.77	31.77	6.65	38.58	2.08	51.69	73.9	22.2	181	311	-
Hori.	7311.000	PK	45.92	37.73	8.10	39.22	2.08	54.61	73.9	19.2	150	0	-
Hori.	9748.000	PK	45.98	39.40	9.36	39.73	2.08	57.09	73.9	16.8	150	0	-
Hori.	7311.000	AV	34.88	37.73	8.10	39.22	2.08	43.57	53.9	10.3	150	0	Floor noise
Hori.	9748.000	AV	35.00	39.40	9.36	39.73	2.08	46.11	53.9	7.7	150	0	Floor noise
Vert.	450.000	QP	27.50	16.76	7.45	31.63	0.00	20.08	46.0	25.9	129	143	-
Vert.	800.000	QP	22.90	20.82	9.24	31.30	0.00	21.66	46.0	24.3	100	203	-
Vert.	900.000	QP	26.90	22.11	9.71	30.86	0.00	27.86	46.0	18.1	134	140	-
Vert.	4874.000	PK	49.31	31.77	6.65	38.58	2.08	51.23	73.9	22.6	104	179	-
Vert.	7311.000	PK	45.82	37.73	8.10	39.22	2.08	54.51	73.9	19.3	150	0	-
Vert.	9748.000	PK	45.94	39.40	9.36	39.73	2.08	57.05	73.9	16.8	150	0	-
Vert.	7311.000	AV	35.16	37.73	8.10	39.22	2.08	43.85	53.9	10.0	150	0	Floor noise
Vert.	9748.000	AV	35.39	39.40	9.36	39.73	2.08	46.50	53.9	7.4	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	37.99	31.77	6.65	38.58	2.17	2.08	42.08	53.9	11.8	-
Vert.	4874.000	AV	38.42	31.77	6.65	38.58	2.17	2.08	42.51	53.9	11.3	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Duty factor refer to "Burst rate confirmation" sheet ($20\log(0.253 / 0.1972) = 2.17\text{ dB}$: Test report 13568152S-K).

Radiated Spurious Emission

Report No.	13994981S-H-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	2
Date	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	21 deg.C, 36 %RH	22 deg.C, 34 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yohsuke Matsuzawa (1 GHz -2.8 GHz)	Yohsuke Matsuzawa (2.8 GHz -10 GHz)	Miku Ikudome (10 GHz -18 GHz)	Shunsaku Yumi (18 GHz -26.5 GHz)
Mode	Tx 11n-20 2462 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.73	28.47	14.28	38.67	2.08	55.89	73.9	18.0	106	113	-
Hori.	4924.000	PK	44.27	31.89	6.69	38.61	2.08	46.32	73.9	27.5	155	297	-
Hori.	7386.000	PK	44.76	37.82	8.13	39.25	2.08	53.54	73.9	20.3	150	0	-
Hori.	9848.000	PK	45.41	39.55	9.41	39.75	2.08	56.70	73.9	17.2	150	0	-
Hori.	7386.000	AV	35.53	37.82	8.13	39.25	2.08	44.31	53.9	9.5	150	0	Floor noise
Hori.	9848.000	AV	36.24	39.55	9.41	39.75	2.08	47.53	53.9	6.3	150	0	Floor noise
Vert.	2483.500	PK	46.90	28.47	14.28	38.67	2.08	53.06	73.9	20.8	377	271	-
Vert.	4924.000	PK	43.95	31.89	6.69	38.61	2.08	46.00	73.9	27.9	161	168	-
Vert.	7386.000	PK	44.82	37.82	8.13	39.25	2.08	53.60	73.9	20.3	150	0	-
Vert.	9848.000	PK	44.79	39.55	9.41	39.75	2.08	56.08	73.9	17.8	150	0	-
Vert.	7386.000	AV	35.74	37.82	8.13	39.25	2.08	44.52	53.9	9.3	150	0	Floor noise
Vert.	9848.000	AV	36.42	39.55	9.41	39.75	2.08	47.71	53.9	6.1	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	37.59	28.47	14.28	38.67	2.17	2.08	45.92	53.9	7.9	*1)
Hori.	4924.000	AV	35.14	31.89	6.69	38.61	2.17	2.08	39.36	53.9	14.5	-
Vert.	2483.500	AV	36.84	28.47	14.28	38.67	2.17	2.08	45.17	53.9	8.7	*1)
Vert.	4924.000	AV	35.31	31.89	6.69	38.61	2.17	2.08	39.53	53.9	14.3	-

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.81\text{ m} / 3.0\text{ m}) = 2.08\text{ dB}$

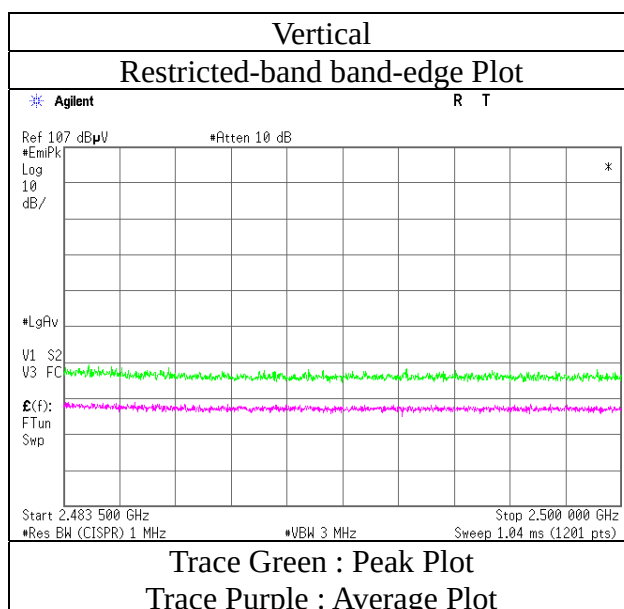
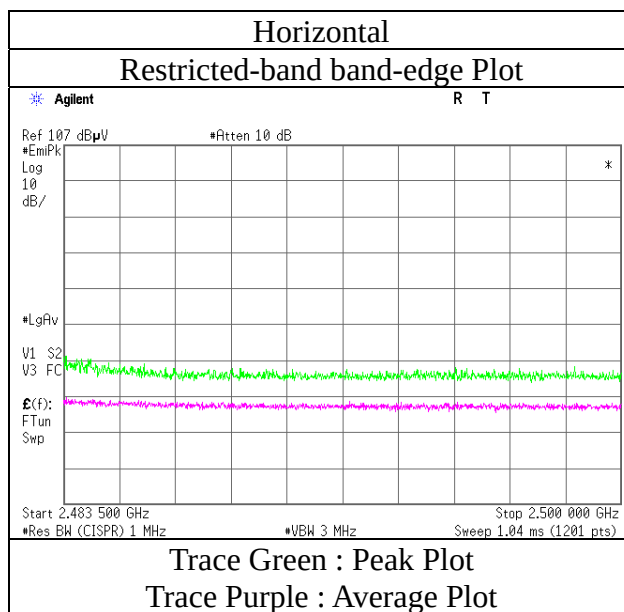
10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Burst rate confirmation" sheet ($20\log(0.253 / 0.1972) = 2.17\text{ dB}$: Test report 13568152S-K).

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No. 13994981S-H-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date November 18, 2021
Temperature / Humidity 21 deg.C, 36 %RH
Engineer Yohsuke Matsuzawa
Mode Tx 11n-20 2462 MHz

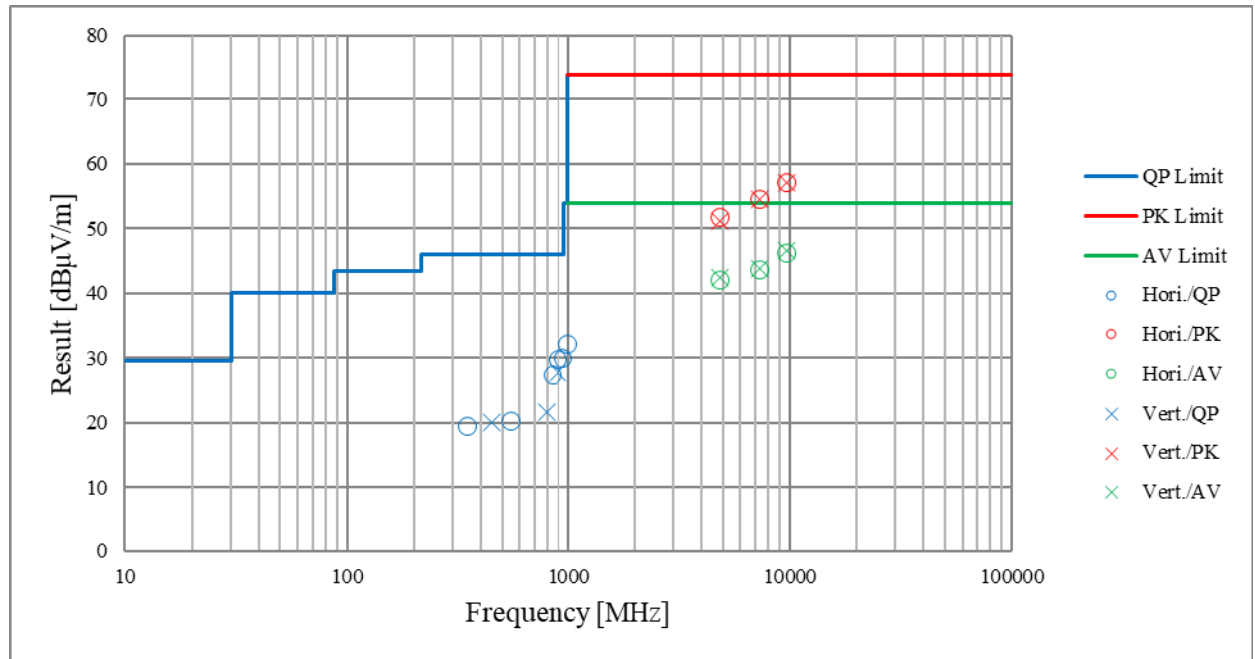


* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

(Plot data, Worst case mode for Maximum Conducted Output Power of the test report mentioned in 3.1)

Report No.	13994981S-H-R1				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	2	2	2	3	2
Date	December 1, 2021	November 18, 2021	November 19, 2021	November 27, 2021	November 30, 2021
Temperature / Humidity	22 deg.C, 38 %RH	21 deg.C, 36 %RH	22 deg.C, 34 %RH	21 deg.C, 26 %RH	20 deg.C, 32 %RH
Engineer	Yosuke Murakami	Yosuke Matsuzawa	Yosuke Matsuzawa	Miku Ikudome	Shunsaku Yumi
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11n-20 2437 MHz				



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

APPENDIX 2: Test instruments

Test equipment (1/2)

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	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
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	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2021/05/21	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2021/02/10	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2021/05/17	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2021/02/08	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2021/03/01	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2021/10/05	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2021/01/26	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2021/02/10	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/141PE/141PE/141PE/141PE/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/141PE/141PE/141PE/141PE/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	2021/01/19	12
RE	SCC-G43	156380	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	SN MY 13406/4E	2021/05/17	12
RE	SCC-G50	178573	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	MY13407/4E	2021/03/01	12

Test equipment (2/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
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-G58	183047	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800287/4A	2021/05/17	12
RE	SCC-G70	200010	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575618/4	2021/07/06	12
RE	SFL-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2021/04/08	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-10	194685	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	711	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	SOS-23	191840	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2021/04/13	12
RE	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2021/08/09	12
RE	STR-02	145791	Test Receiver	Rohde & Schwarz	ESCI	100575	2021/06/02	12
RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2021/04/28	12
RE	STS-03	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2021/09/14	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

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