RADIO TEST REPORT

Test Report No. 14937749H-B-R2

Customer	**KEYENCE CORPORATION**
Description of EUT	**WLAN unit**
Model Number of EUT	**WM-WL**
FCC ID	**RF41637A**
Test Regulation	**FCC Part 15 Subpart E**
Test Result	**Complied**
Issue Date	**January 12, 2024**
Remarks	**Wireless LAN (5 GHz band) part**

Representative Test Engineer	Approved By
	
Kiyoshiro Okazaki Engineer	Satofumi Matsuyama Engineer

CERTIFICATE 5107.02

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.

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

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 23.0

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

REVISION HISTORY

Original Test Report No. 14937749H-B

This report is a revised version of 14937749H-B. 14937749H-B is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14937749H-B	September 29, 2023	-
1	14937749H-B-R1	October 25, 2023	APPENDIX 1: Test Data Radiated Spurious Emission P.28 to P.44 Replacement of radiated spurious emission data for Band-edge with new data.
2	14937749H-B-R2	January 12, 2024	Cover Page. SECTION 2.1, SECTION 4.2 -Correction of Description of EUT. Wide area CMM→WLAN unit
2	14937749H-B-R2	January 12, 2024	SECTION 2.2: Product Description Radio Specification -Addition of below note. This report contains data provided by the customer which can impact the validity of results. UL Japan, Inc. is only responsible for the validity of results after the integration of the data provided by the customer. The data provided by the customer is marked “a)” in the table below. -Addition of a) in the item of antenna gain for wireless LAN (5 GHz band) part.
2	14937749H-B-R2	January 12, 2024	SECTION 3.2: Procedures and Results -Correction of Results for 6 dB Emission Bandwidth. Complied→N/A -Addition of explanatory note *3) of Remarks for 6 dB Emission Bandwidth.

Reference: Abbreviations (Including words undescribed in this report)

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

CONTENTS PAGE

SECTION 1: Customer Information

Company Name	KEYENCE CORPORATION
Address	1-3-14, Higashinakajima, Higashiyodogawa-ku, Osaka-shi, Osaka, Japan
Telephone Number	+81-6-6379-1111
Contact Person	Takashi Suzuki

The information provided from the customer is as follows;
- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	WLAN unit
Model Number	WM-WL
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	August 21, 2023
Test Date	August 30 to October 4, 2023

2.2 Product Description

General Specification

Rating	DC 1.8 V / DC 3.3 V
Operating temperature	10 deg. C to 35 deg. C

Radio Specification

This report contains data provided by the customer which can impact the validity of results. UL Japan, Inc. is only responsible for the validity of results after the integration of the data provided by the customer. The data provided by the customer is marked “a)” in the table below.

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
Antenna Gain	0.6 dBi

WLAN (IEEE802.11a/11n-20/11ac-20/11n-40/11ac-40/11ac-80)

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band	5180 MHz to 5240 MHz
	40 MHz Band	5190 MHz to 5230 MHz
	80 MHz Band	5210 MHz
Type of Modulation	OFDM	
Antenna Gain [a)]	1.80 dBi	

SECTION 3: Test specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart E The latest version on the first day of the testing period
Title	FCC 47 CFR Part 15 Radio Frequency Device Subpart E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements

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

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013	**FCC:** 15.407 (b) (6) / 15.207	16.11 dB, 0.47810 MHz, N, AV	Complied	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
26 dB Emission Bandwidth	**FCC:** KDB Publication Number 789033	**FCC:** 15.407 (a) (1) (2) (3)	See data	N/A	*1)
	ISED: -	**ISED:** -			
Maximum Conducted Output Power	**FCC:** KDB Publication Number 789033	**FCC:** 15.407 (a) (1) (2) (3)		Complied	Conducted
	ISED: -	**ISED:** RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1			
Maximum Power Spectral Density	**FCC:** KDB Publication Number 789033	**FCC :** 15.407 (a) (1) (2) (3)		Complied	Conducted
	ISED: -	**ISED:** RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1			
Spurious Emission Restricted Band Edge	**FCC:** ANSI C63.10-2013 KDB Publication Number 789033	**FCC:** 15.407 (b), 15.205 and 15.209	1.0 dB 5150.0 MHz, AV, Vertical	Complied	Conducted (< 30 MHz) / Radiated (> 30 MHz) *2)
	ISED: -	**ISED:** RSS-247 6.2.1.2 6.2.2.2 6.2.3.2 6.2.4.2			
6 dB Emission Bandwidth	**FCC:** ANSI C63.10-2013	**FCC:** 15.407 (e)	See data	N/A	*3)
	ISED: -	**ISED:** RSS-247 6.2.4.1			

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.
* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

*1) The test was not performed since the EUT supports 5 GHz (only W52).
*2) Radiated test was selected over 30 MHz based on FCC 15.407 (b) and KDB 789033 D02 G.3.b).
*3) The test is not applicable since the EUT does not support to W58 bands.

FCC Part 15.31 (e)
This EUT provides the stable voltage constantly to RF Part 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

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
99 % Occupied Band Width	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	-	Conducted

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.
Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor *k*=2.

Conducted emission

Item	Frequency range	Unit	Calculated Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	dB	3.7
	0.15 MHz to 30 MHz	dB	3.3

Radiated emission

Measurement distance	Frequency range		Unit	Calculated Uncertainty (+/-)
3 m	9 kHz to 30 MHz		dB	3.3
10 m			dB	3.1
3 m	30 MHz to 200 MHz	(Horizontal)	dB	4.8
		(Vertical)	dB	5.0
	200 MHz to 1000 MHz	(Horizontal)	dB	5.1
		(Vertical)	dB	6.2
10 m	30 MHz to 200 MHz	(Horizontal)	dB	4.8
		(Vertical)	dB	4.8
	200 MHz to 1000 MHz	(Horizontal)	dB	4.9
		(Vertical)	dB	5.0
3 m	1 GHz to 6 GHz		dB	4.9
	6 GHz to 18 GHz		dB	5.2
1 m	10 GHz to 26.5 GHz		dB	5.5
	26.5 GHz to 40 GHz		dB	5.4
0.5 m	26.5 GHz to 40 GHz		dB	5.4
10 m	1 GHz to 18 GHz		dB	5.3

Antenna Terminal Conducted tests

Item	Unit	Calculated Uncertainty (+/-)
Antenna Terminated Conducted Emission / Power Density / Burst Power	dB	3.28
Adjacent Channel Power (ACP)	dB	2.27
Bandwidth (OBW)	%	0.96
Time Readout (Time span upto 100 msec)	%	0.11
Time Readout (Time span upto 1000 msec)	%	0.11
Time Readout (Time span upto 60 sec)	%	0.02
Power Measurement (Power Meter)	dB	1.50
Frequency Readout (Frequency Counter)	ppm	0.67
Frequency Readout (Spectrum analyzer frequency readout function)	ppm	1.61
Temperature (Constant temperature bath)	deg.C	0.78
Humidity (Constant temperature bath)	%RH	2.80
Modulation Characteristics	%	6.93
Frequency for Mobile	ppm	0.08

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan
Telephone: +81-596-24-8999
A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919
ISED Lab Company Number: 2973C / CAB identifier: JP0002

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.10 shielded room	3.8 x 2.8 x 2.8	3.8 x 2.8	-	-
No.11 measurement room	4.0 x 3.4 x 2.5	N/A	-	-
No.12 measurement room	2.6 x 3.4 x 2.5	N/A	-	-
Large Chamber	16.9 x 22.1 x 10.17	16.9 x 22.1	-	10 m
Small Chamber	5.3 x 6.69 x 3.59	5.3 x 6.69	-	-

* Size of vertical conducting plane (for Conducted Emission test): 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	Remarks*
IEEE 802.11a (11a)	48 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 7, PN9
IEEE 802.11ac 20 MHz BW (11ac-20)	MCS 6, PN9
IEEE 802.11n 40 MHz BW (11n-40)	MCS 6, PN9
IEEE 802.11ac 40 MHz BW (11ac-40)	MCS 0, PN9
IEEE 802.11ac 80 MHz BW (11ac-80)	MCS 3, PN9
*The worst condition was determined based on the test result of Maximum Conducted Output Power.	

*Power of the EUT was set by the software as follows
Power Setting: Refer to the following table
Software: Name: cypress-fmac
Version: v5.10.9
(Date: September 9, 2022, Storage location: EUT memory)

*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

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/ax mode by the pre-test.

[Power Setting]

Mode	Ch	Frequency	Power Setting [dBm]
11a	36	5180 MHz	11
	44, 48	5220 MHz, 5240 MHz	12
11n-20	36	5180 MHz	11
	44, 48	5220 MHz, 5240 MHz	12
11ac-20	36	5180 MHz	11
	44, 48	5220 MHz, 5240 MHz	12
11n-40	38	5190 MHz	11
	46	5230 MHz	12
11ac-40	38	5190 MHz	11
	46	5230 MHz	12
11ac-80	42	5210 MHz	11

***** Power setting values are different from those of the final product because the power setting values were adjusted so that the maximum power value of the product specifications is output.

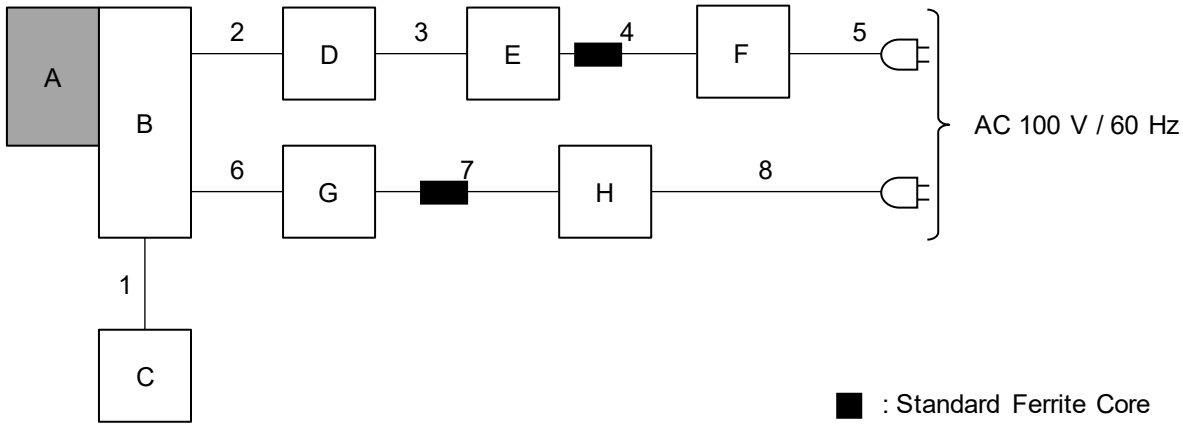
*The Details of Operation Mode(s)

Test Item	Operating Mode	Tested Frequency
Conducted emission, Radiated Spurious Emission (Below 1 GHz), Conducted Spurious Emission	Tx 11ac-40 *1)	5230 MHz
Radiated Spurious Emission (Above 1 GHz), 99 % Occupied Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density	Tx 11a Tx 11ac-20 *2)	5180 MHz 5220 MHz 5240 MHz
	Tx 11n-40 Tx 11ac-40	5190 MHz 5230 MHz
	Tx 11ac-80	5210 MHz

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.
*2) Since each of 20 MHz BW (11n-20 / 11ac-20) have the same modulation method and no differences in transmitting specification, the test was performed on the representative mode that had the highest output power. The test was performed with the antenna that had higher power as a representative.

4.2 Configuration and Peripherals

Antenna Terminal Conducted test



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

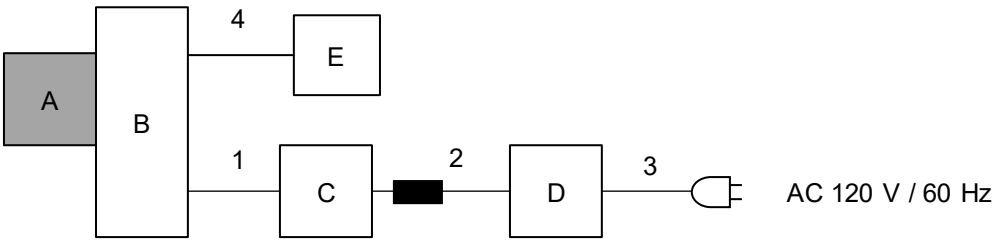
Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	WLAN unit	WM-WL	001	KEYENCE CORPORATION	EUT
B	Jig Board 01	-	-	KEYENCE CORPORATION	-
C	Jig Board 02	-	-	KEYENCE CORPORATION	-
D	Jig Board 03	-	-	KEYENCE CORPORATION	-
E	Laptop PC	CF-NX1GWGYS	2KKSA14614	Panasonic	-
F	AC Adapter	CF-AA6412C	6412CM112714770A	Panasonic	-
G	Jig Board 04	-	-	KEYENCE CORPORATION	-
H	AC Adapter	OP-88369	004214	KEYENCE CORPORATION	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.4	Unshielded	Unshielded	-
2	Signal Cable	0.2	Unshielded	Unshielded	-
3	LAN Cable	2.0	Unshielded	Unshielded	-
4	DC Cable	1.6	Unshielded	Unshielded	-
5	AC Cable	0.8	Unshielded	Unshielded	-
6	DC Cable	0.1	Unshielded	Unshielded	-
7	DC Cable	1.5	Unshielded	Unshielded	-
8	AC Cable	0.8	Unshielded	Unshielded	-

Conducted Emission and Radiated Emission



■ : Standard Ferrite Core

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

*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	WLAN unit	WM-WL	001	KEYENCE CORPORATION	EUT
B	Jig Board 01	-	-	KEYENCE CORPORATION	-
C	Jig Board 04	-	-	KEYENCE CORPORATION	-
D	AC Adapter	OP-88369	6576	KEYENCE CORPORATION	*1)
E	Jig Board 03	-	-	KEYENCE CORPORATION	-

*1) Conducted emission test was conducted using AC adapter that is accessories for limited equipment connected to the EUT.

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.1	Unshielded	Unshielded	-
2	DC Cable	1.5	Unshielded	Unshielded	-
3	AC Cable	1.0 *2) 1.8 *3)	Unshielded	Unshielded	-
4	Signal Cable	0.2	Unshielded	Unshielded	-

*2) Used for Conducted Emission test
*3) Used for Radiated Emission test

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

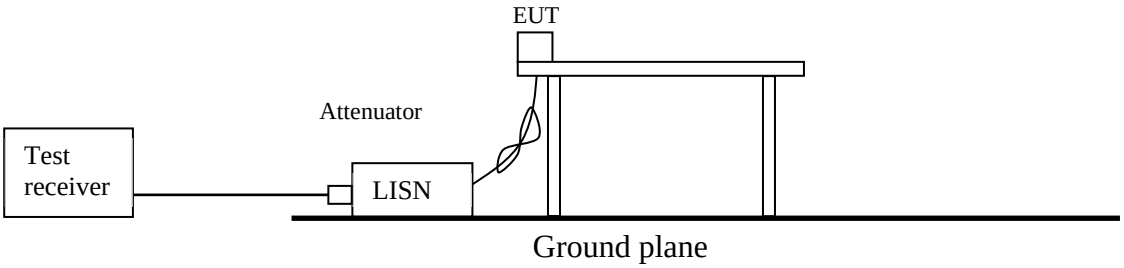
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

Detector : QP and CISPR Average
Measurement Range : 0.15 MHz to 30 MHz
Test Data : APPENDIX
Test Result : Pass

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1 GHz >
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

< Above 1 GHz >
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

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

< Below 1 GHz >
The result also satisfied with the general limits specified in section 15.209 (a).

< Above 1 GHz >
Inside of restricted bands (Section 15.205):
Apply to limit in the Section 15.209 (a).

Outside of the restricted bands:
Apply to limit 68.2 dBuV/m, 3 m (-27 dBm e.i.r.p.*) in the Section 15.407 (b) (1) (2) (3).

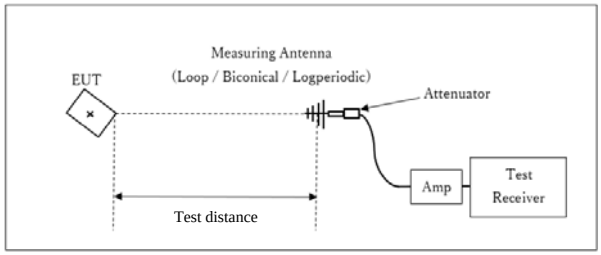
Test Antennas are used as below;

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

Frequency	Below 1 GHz	Above 1 GHz	
Instrument Used	Test Receiver	Spectrum Analyzer	
Detector	QP	Peak	Average
IF Bandwidth	BW: 120 kHz	RBW: 1 MHz VBW: 3 MHz	Method AD: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: ≥ 100 traces If duty cycle was less than 98%, a duty factor was added to the results. Integration Method: RBW: 100 kHz VBW: 300 kHz Span: 2 MHz Band Power: 1 MHz Detector: Power Averaging (RMS) Trace: ≥ 100 traces If duty cycle was less than 98%, a duty factor was added to the results.

Figure 2: Test Setup

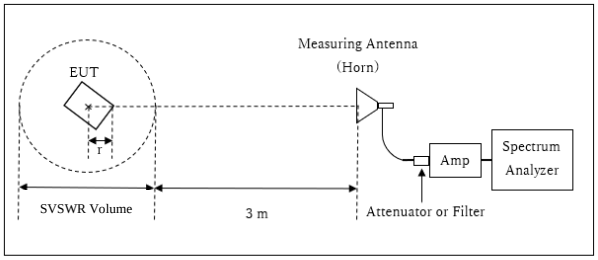
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz



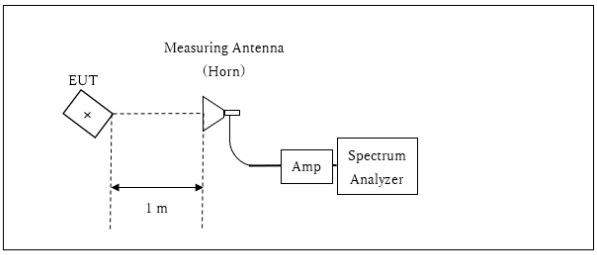
r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (4.0 m / 3.0 m) = 2.50 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 4.0 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.0m

* The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.

10 GHz to 40 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 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.

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

Measurement Range : 30 MHz to 40 GHz
Test Data : APPENDIX
Test Result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used and Test method
26 dB Bandwidth	Enough to capture the emission	Close to 1 % of EBW	> RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 % to 5 % of OBW	≥ 3 RBW	Auto	Peak	Max Hold	Spectrum Analyzer
6 dB Bandwidth	Enough to capture the emission	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Average	-	Power Meter (Sensor: 80 MHz BW) (Method PM)
Maximum Power Spectral Density	Encompass the entire EBW	1 MHz or 470 kHz *2)	≥ 3 RBW	Auto	RMS Power Averaging (200 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) KDB 789033 D02 says that RBW is set to be 500 kHz for 5.725 GHz to 5.850 GHz, but it is not possible with spectrum analyzer, so RBW Correction Factor (10 log(500 kHz / 470 kHz)) was added to the test result.
*3) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart. (9 kHz to 150 kHz: RBW = 200 Hz, 150 kHz to 30 MHz: RBW = 10 kHz).
*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

The test results and limit are rounded off to two decimals place, so some differences might be observed.
The equipment and cables were not used for factor 0 dB of the data sheets.

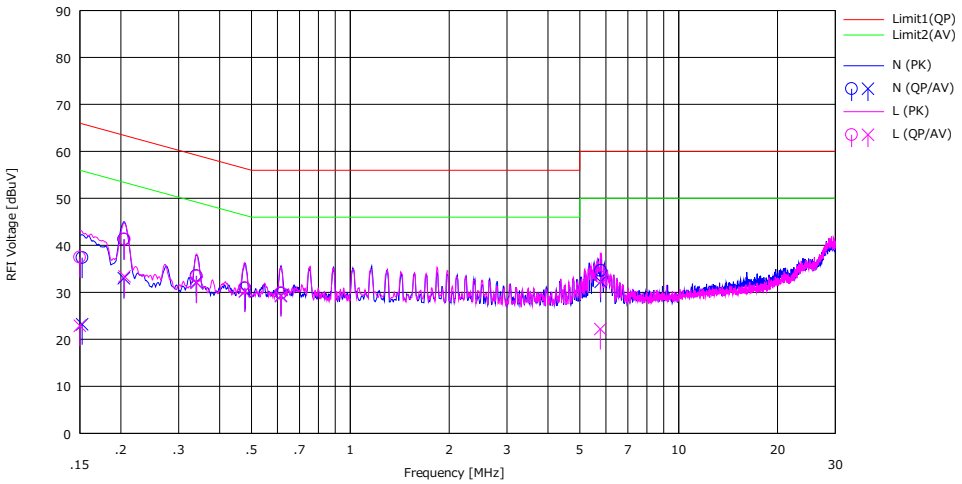
Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test Data

Conducted Emission

Test place	Ise EMC Lab. No.2 Shielded Room
Date	September 8, 2023
Temperature / Humidity	20 deg. C / 59 % RH
Engineer	Kiyoshiro Okazaki
Mode	Tx 11ac-40 5230 MHz

Limit : FCC_Part 15 Subpart E(15.207)



No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	LISN	LOSS	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15255	24.20	10.00	0.08	13.11	37.39	23.19	65.86	55.86	28.47	32.67	N	
2	0.20440	28.10	19.80	0.08	13.12	41.30	33.00	63.43	53.43	22.13	20.43	N	
3	0.33955	20.30	18.90	0.08	13.16	33.54	32.14	59.21	49.21	25.67	17.07	N	
4	0.47810	17.60	17.00	0.08	13.18	30.86	30.26	56.37	46.37	25.51	16.11	N	
5	0.61495	16.50	16.00	0.08	13.20	29.78	29.28	56.00	46.00	26.22	16.72	N	
6	5.78800	20.80	18.40	0.17	13.68	34.65	32.25	60.00	50.00	25.35	17.75	N	
7	0.15000	24.30	9.70	0.07	13.11	37.48	22.88	66.00	56.00	28.52	33.12	L	
8	0.20525	28.10	20.20	0.08	13.12	41.30	33.40	63.40	53.40	22.10	20.00	L	
9	0.34040	20.20	18.80	0.07	13.16	33.43	32.03	59.19	49.19	25.76	17.16	L	
10	0.47640	17.70	16.90	0.08	13.18	30.96	30.16	56.40	46.40	25.44	16.24	L	
11	0.61495	16.60	15.90	0.08	13.20	29.88	29.18	56.00	46.00	26.12	16.82	L	
12	5.77000	19.40	8.30	0.20	13.68	33.28	22.18	60.00	50.00	26.72	27.82	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.8 Measurement Room
Date	August 30, 2023
Temperature / Humidity	20 deg. C / 61 % RH
Engineer	Tetsuro Yoshida
Mode	Tx

11a

Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
5180	***16886.1***
5220	16825.7
5240	16858.1

11ac-20

Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
5180	17968.4
5220	***17976.7***
5240	17966.9

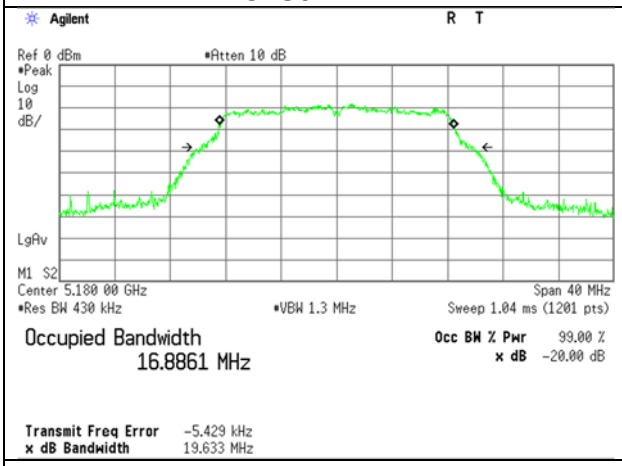
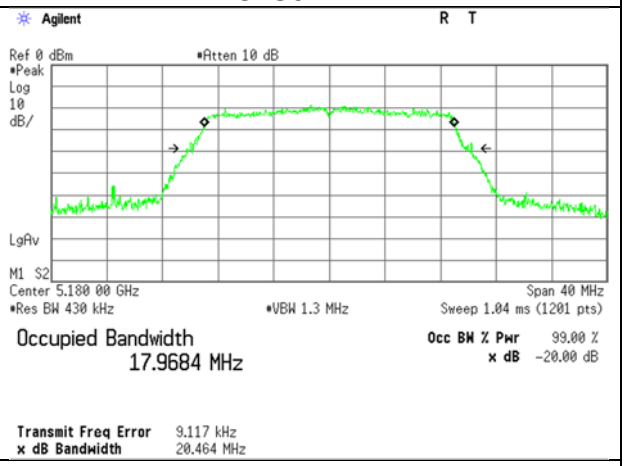
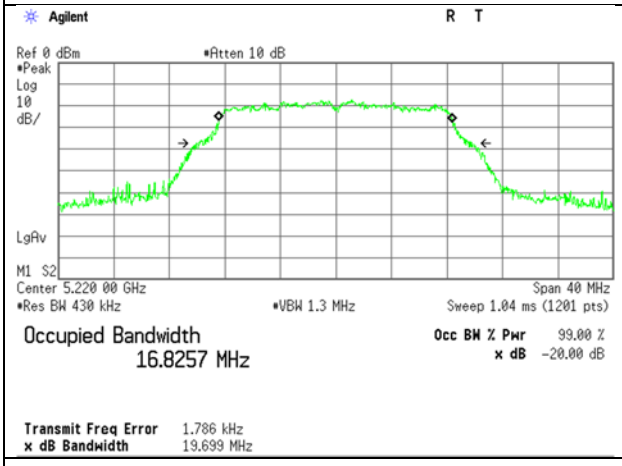
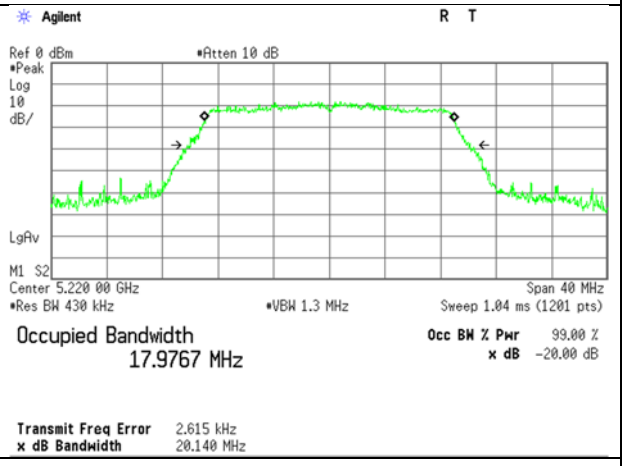
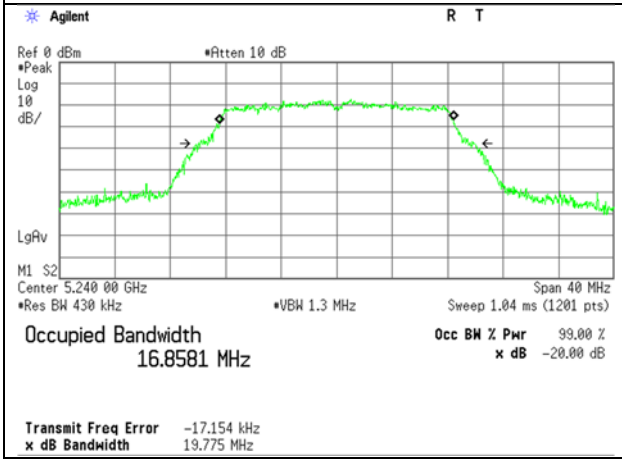
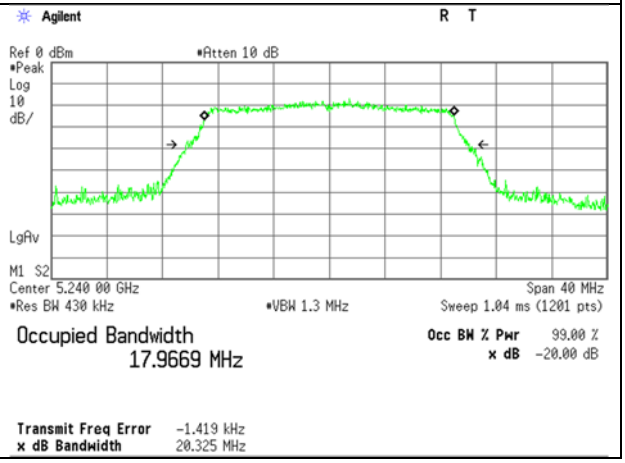
11n-40/11ac-40

Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
5190	***36337.4***
5230	36233.9

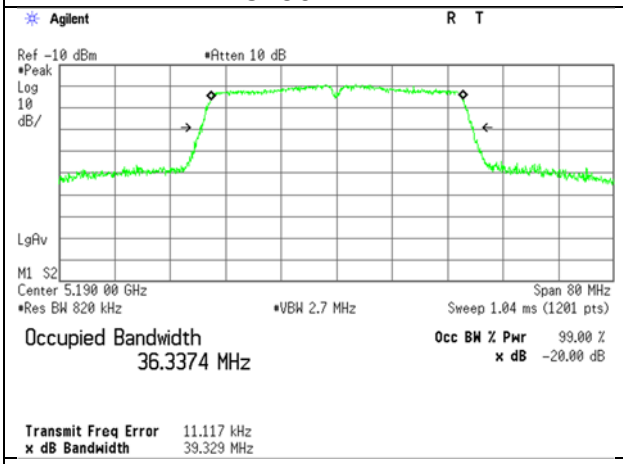
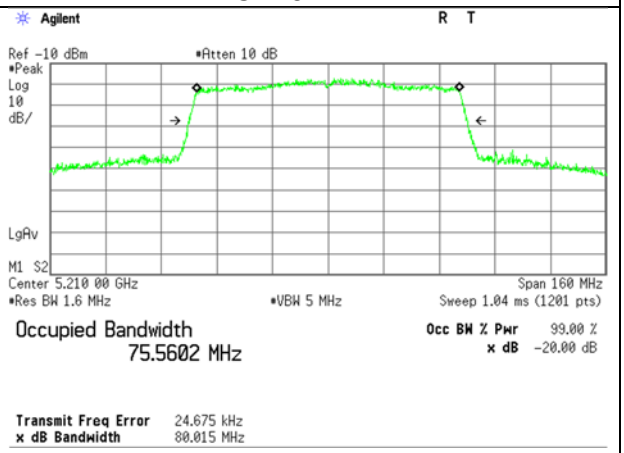
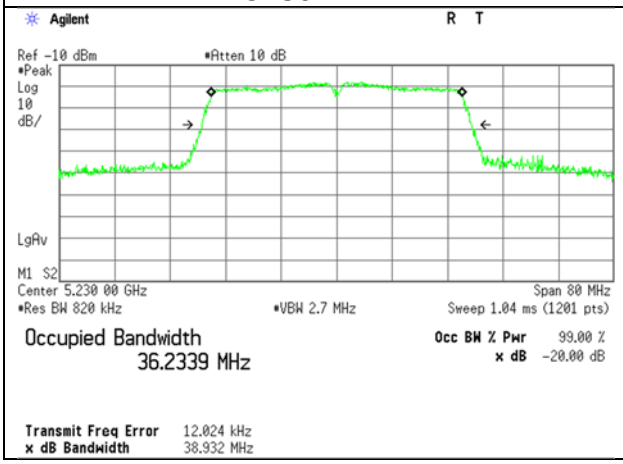
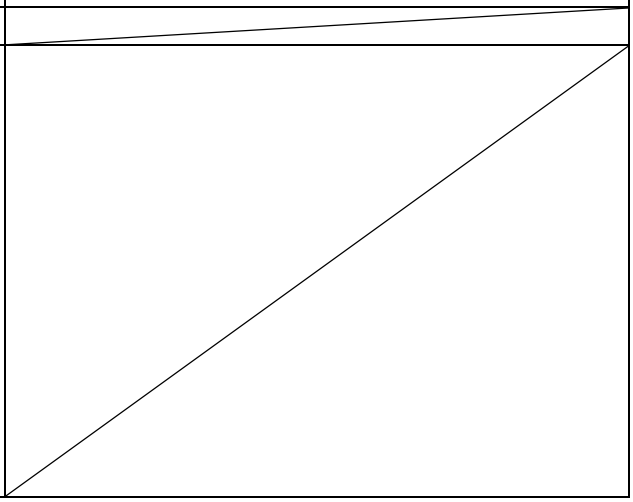
11ac-80

Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
5210	***75560.2***

99 % Occupied Bandwidth

11a	11ac-20
5180 MHz	**5180 MHz**
	
5220 MHz	**5220 MHz**
	
5240 MHz	**5240 MHz**
	

99 % Occupied Bandwidth

11ac-40	11ac-80
5190 MHz	5210 MHz
	
5230 MHz	
	

Maximum Conducted Output Power

Test place	Ise EMC Lab. No.8 Measurement Room
Date	September 26, 2023
Temperature / Humidity	20 deg. C / 61 % RH
Engineer	Yuta Moriya
Mode	Tx

11a Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power Result		Conducted Power Limit	Conducted Power Margin	e.i.r.p. Result		e.i.r.p. Limit	e.i.r.p. Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5180	-11.54	2.76	20.01	0.30	1.8	-	16.886	11.53	14.22	23.97	12.44	13.33	21.53	29.97	16.64
5220	-10.59	2.78	20.01	0.30	1.8	-	16.826	***12.50***	***17.78***	23.97	11.47	***14.30***	***26.92***	29.97	15.67
5240	-10.70	2.79	20.01	0.30	1.8	-	16.858	12.40	17.38	23.97	11.57	14.20	26.30	29.97	15.77

Sample Calculation:
Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

11ac-20 Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power Result		Conducted Power Limit	Conducted Power Margin	e.i.r.p. Result		e.i.r.p. Limit	e.i.r.p. Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5180	-11.58	2.76	20.01	0.32	1.8	-	17.968	11.51	14.16	23.97	12.46	13.31	21.43	29.97	16.66
5220	-10.60	2.78	20.01	0.32	1.8	-	17.977	***12.51***	***17.82***	23.97	11.46	***14.31***	***26.98***	29.97	15.66
5240	-10.63	2.79	20.01	0.32	1.8	-	17.967	12.49	17.74	23.97	11.48	14.29	26.85	29.97	15.68

Sample Calculation:
Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

11ac-40 Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power Result		Conducted Power Limit	Conducted Power Margin	e.i.r.p. Result		e.i.r.p. Limit	e.i.r.p. Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5190	-11.35	2.76	20.01	0.08	1.8	-	36.337	11.50	14.13	23.97	12.47	13.30	21.38	29.97	16.67
5230	-10.35	2.78	20.01	0.08	1.8	-	36.234	***12.52***	***17.86***	23.97	11.45	***14.32***	***27.04***	29.97	15.65

Sample Calculation:
Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

11ac-80 Applied limit: 15.407, mobile and portable client device

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power Result		Conducted Power Limit	Conducted Power Margin	e.i.r.p. Result		e.i.r.p. Limit	e.i.r.p. Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5210	-11.78	2.77	20.01	0.51	1.8	-	75.560	***11.51***	***14.16***	23.97	12.46	***13.31***	***21.43***	29.97	16.66

Sample Calculation:
Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

Maximum Conducted Output Power (Worst data rate check)

Test place	Ise EMC Lab. No.8 Measurement Room
Date	August 30, 2023
Temperature / Humidity	20 deg. C / 61 % RH
Engineer	Tetsuro Yoshida
Mode	Tx

5220 MHz

Mode	Rate Mbps	Burst power [dBm]	Remarks
11a	6	-10.06	
	9	-9.76	
	12	-9.66	
	18	-9.61	
	24	-9.66	
	36	-9.64	
	48	-9.50	*
	54	-9.54	

5230 MHz

Mode	MCS Number	Burst power [dBm]	Remarks
11n-40	0	-9.91	
	1	-9.82	
	2	-10.09	
	3	-10.03	
	4	-9.85	
	5	-9.98	
	6	-9.77	*
	7	-9.79	

5210 MHz

Mode	MCS Number	Burst power [dBm]	Remarks
11ac-80	0	-10.74	
	1	-10.68	
	2	-10.69	
	3	-10.65	*
	4	-10.72	
	5	-10.69	
	6	-10.71	
	7	-10.71	
	8	-10.76	
	9	-10.68	

5220 MHz

Mode	MCS Number	Burst power [dBm]	Remarks
11n-20	0	-9.81	
	1	-10.02	
	2	-10.04	
	3	-10.01	
	4	-9.88	
	5	-9.78	
	6	-9.80	
	7	-9.76	*

5230 MHz

Mode	MCS Number	Burst power [dBm]	Remarks
11ac-40	0	-9.17	*
	1	-9.23	
	2	-9.35	
	3	-9.22	
	4	-9.36	
	5	-9.37	
	6	-9.35	
	7	-9.39	
	8	-9.39	
	9	-9.40	

5220 MHz

Mode	MCS Number	Burst power [dBm]	Remarks
11ac-20	0	-10.02	
	1	-9.90	
	2	-10.08	
	3	-10.08	
	4	-9.88	
	5	-9.79	
	6	-9.71	*
	7	-10.01	
	8	-9.88	
	9	-9.77	

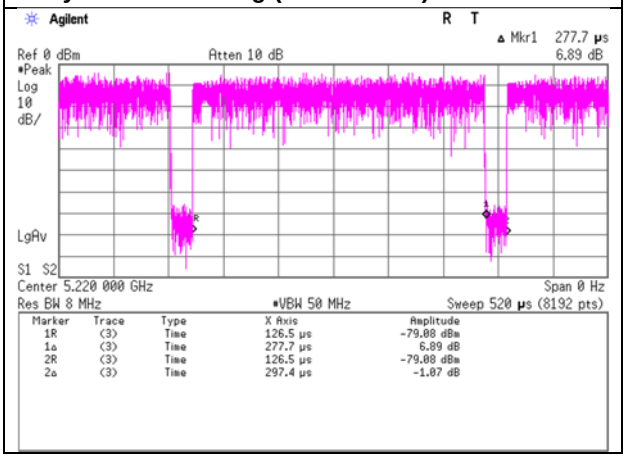
* Worst rate
This test was conduted by the use of Gate function.
All comparison were carried out on same frequency and measurement factors.

Burst rate confirmation

Test place	Ise EMC Lab. No.8 Measurement Room
Date	August 30, 2023
Temperature / Humidity	20 deg. C / 61 % RH
Engineer	Tetsuro Yoshida
Mode	Tx

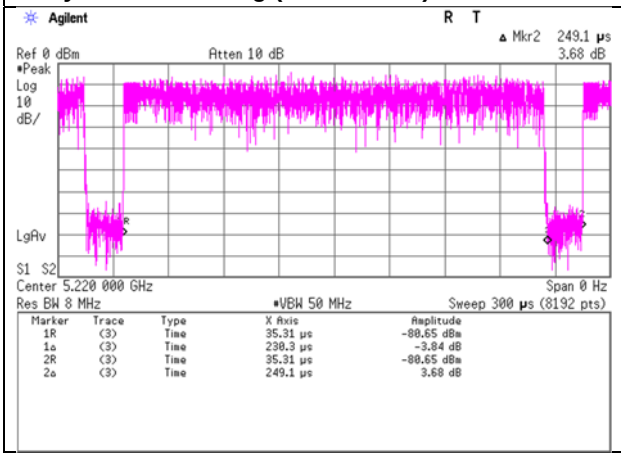
11a 48 Mbps

Tx on / (Tx on + Tx off) =	0.934
Tx on / (Tx on + Tx off) * 100 =	93.4 %
Duty factor = 10 * log (297.4 / 277.7) =	0.30 dB



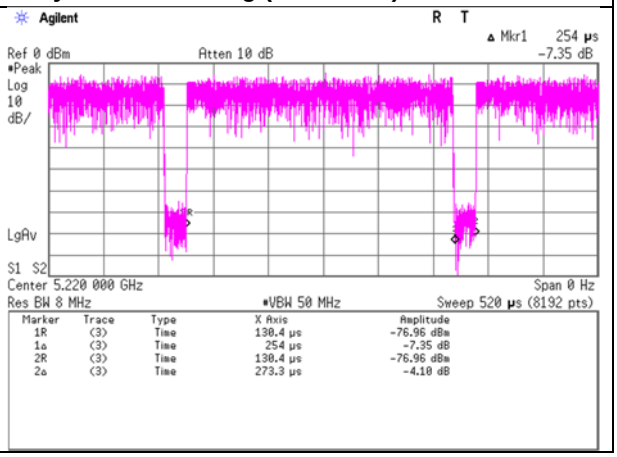
11n-20 MCS 7

Tx on / (Tx on + Tx off) =	0.925
Tx on / (Tx on + Tx off) * 100 =	92.5 %
Duty factor = 10 * log (249.1 / 230.3) =	0.34 dB



11ac-20 MCS 6

Tx on / (Tx on + Tx off) =	0.929
Tx on / (Tx on + Tx off) * 100 =	92.9 %
Duty factor = 10 * log (273.3 / 254) =	0.32 dB

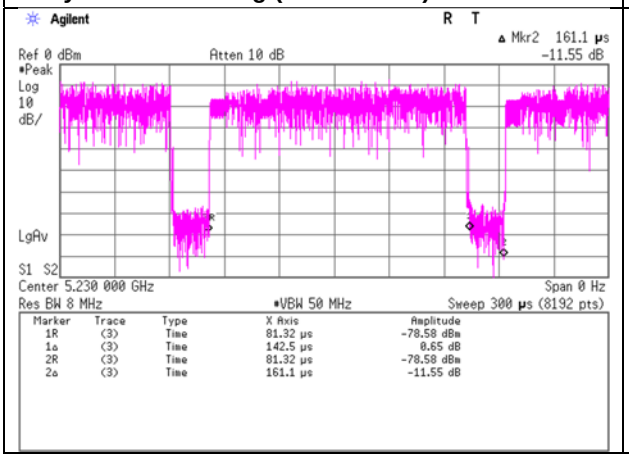


Burst rate confirmation

Test place	Ise EMC Lab. No.8 Measurement Room
Date	August 30, 2023
Temperature / Humidity	20 deg. C / 61 % RH
Engineer	Tetsuro Yoshida
Mode	Tx

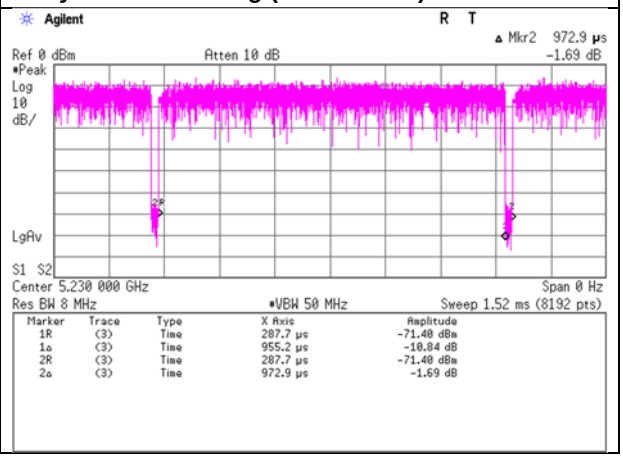
11n-40 MCS 6

Tx on / (Tx on + Tx off) =	0.885
Tx on / (Tx on + Tx off) * 100 =	88.5 %
Duty factor = 10 * log (161.1 / 142.5) =	0.53 dB



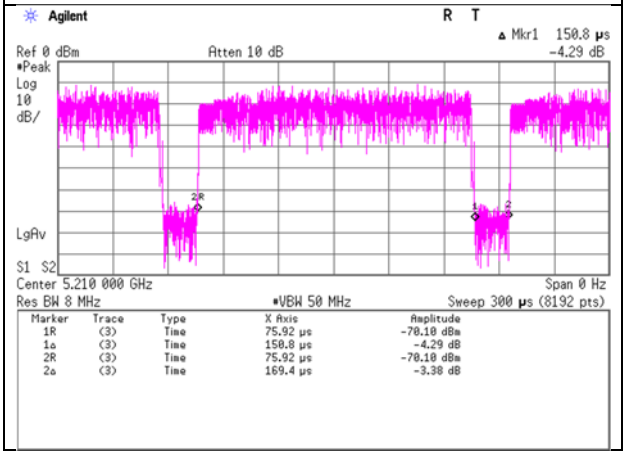
11ac-40 MCS 0

Tx on / (Tx on + Tx off) =	0.982
Tx on / (Tx on + Tx off) * 100 =	98.2 %
Duty factor = 10 * log (972.9 / 955.2) =	0.08 dB



11ac-80 MCS 3

Tx on / (Tx on + Tx off) =	0.890
Tx on / (Tx on + Tx off) * 100 =	89.0 %
Duty factor = 10 * log (169.4 / 150.8) =	0.51 dB



Maximum Power Spectral Density

Test place	Ise EMC Lab. No.8 Measurement Room
Date	September 26, 2023
Temperature / Humidity	20 deg. C / 61 % RH
Engineer	Yuta Moriya
Mode	Tx

11a

Applied limit: 15.407, mobile and portable client device

Tested Frequency	PSD Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	RBW Correction Factor	PSD (Conducted) Result	PSD (Conducted) Limit	PSD (Conducted) Margin	PSD (e.i.r.p.) Result	PSD (e.i.r.p.) Limit	PSD (e.i.r.p.) Margin
[MHz]	[dBm/MHz]	[dB]	[dB]	[dB]	[dBi]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]
5180	-20.78	2.76	20.01	0.30	1.8	0.00	2.29	11.00	8.71	4.09	17.00	12.91
5220	-19.83	2.78	20.01	0.30	1.8	0.00	***3.26***	11.00	7.74	***5.06***	17.00	11.94
5240	-19.91	2.79	20.01	0.30	1.8	0.00	3.19	11.00	7.81	4.99	17.00	12.01

Sample Calculation:
PSD: Power Spectral Density
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

11ac-20

Applied limit: 15.407, mobile and portable client device

Tested Frequency	PSD Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	RBW Correction Factor	PSD (Conducted) Result	PSD (Conducted) Limit	PSD (Conducted) Margin	PSD (e.i.r.p.) Result	PSD (e.i.r.p.) Limit	PSD (e.i.r.p.) Margin
[MHz]	[dBm/MHz]	[dB]	[dB]	[dB]	[dBi]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]
5180	-21.41	2.76	20.01	0.32	1.8	0.00	1.68	11.00	9.32	3.48	17.00	13.52
5220	-20.60	2.78	20.01	0.32	1.8	0.00	2.51	11.00	8.49	4.31	17.00	12.69
5240	-20.40	2.79	20.01	0.32	1.8	0.00	***2.72***	11.00	8.28	***4.52***	17.00	12.48

Sample Calculation:
PSD: Power Spectral Density
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

11ac-40

Applied limit: 15.407, mobile and portable client device

Tested Frequency	PSD Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	RBW Correction Factor	PSD (Conducted) Result	PSD (Conducted) Limit	PSD (Conducted) Margin	PSD (e.i.r.p.) Result	PSD (e.i.r.p.) Limit	PSD (e.i.r.p.) Margin
[MHz]	[dBm/MHz]	[dB]	[dB]	[dB]	[dBi]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]
5190	-24.04	2.76	20.01	0.08	1.8	0.00	-1.19	11.00	12.19	0.61	17.00	16.39
5230	-23.08	2.78	20.01	0.08	1.8	0.00	***-0.21***	11.00	11.21	***1.59***	17.00	15.41

Sample Calculation:
PSD: Power Spectral Density
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

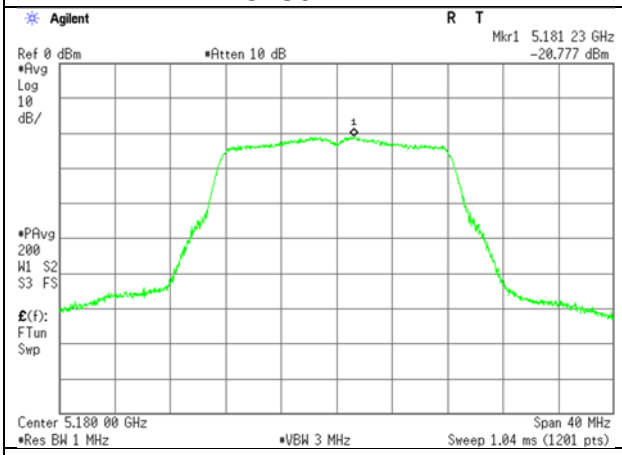
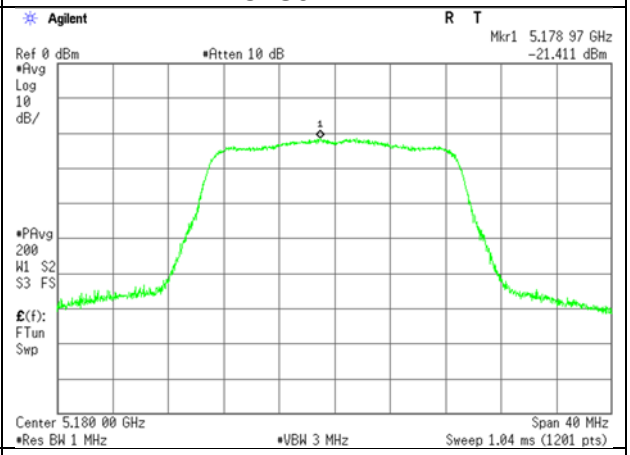
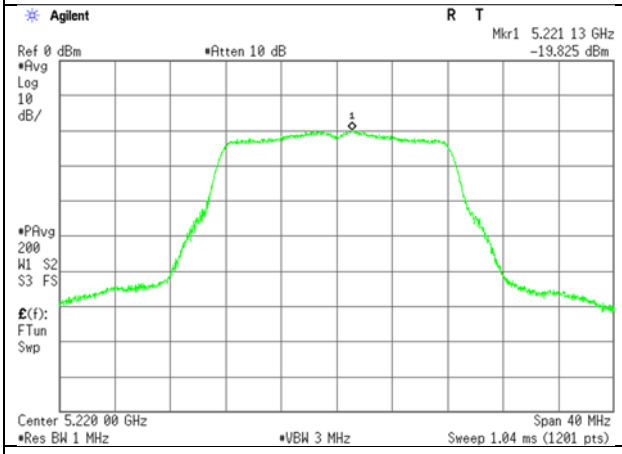
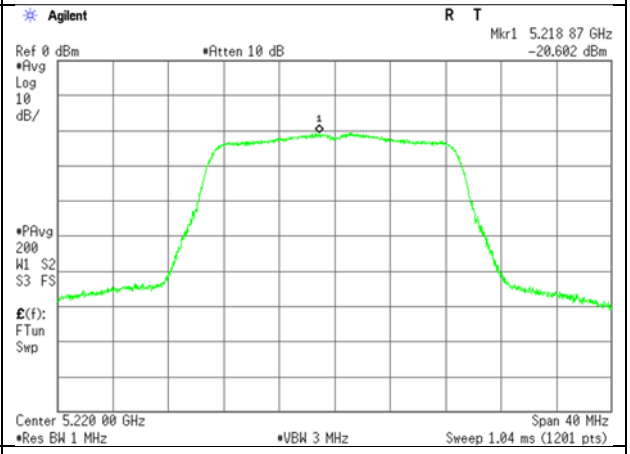
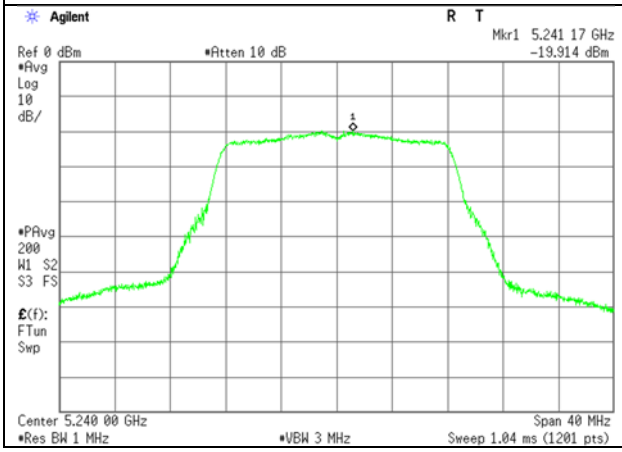
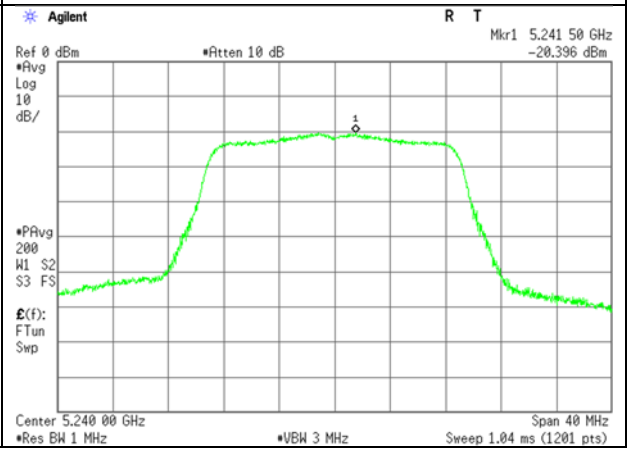
11ac-80

Applied limit: 15.407, mobile and portable client device

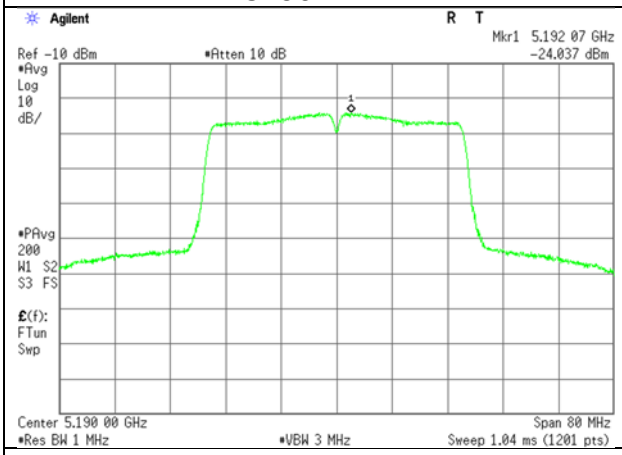
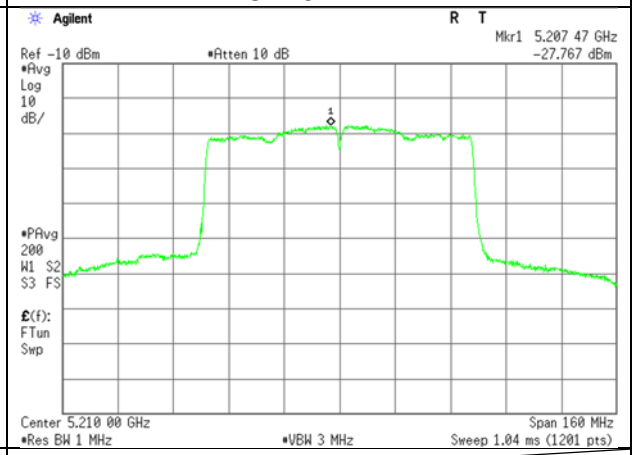
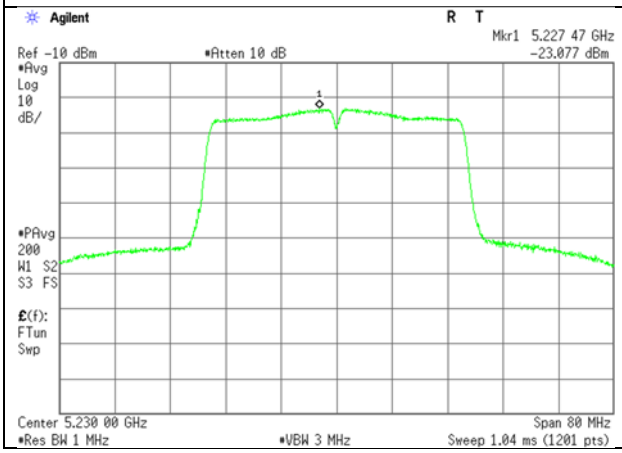
Tested Frequency	PSD Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	RBW Correction Factor	PSD (Conducted) Result	PSD (Conducted) Limit	PSD (Conducted) Margin	PSD (e.i.r.p.) Result	PSD (e.i.r.p.) Limit	PSD (e.i.r.p.) Margin
[MHz]	[dBm/MHz]	[dB]	[dB]	[dB]	[dBi]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]	[dBm/MHz]	[dBm/MHz]	[dB]
5210	-27.77	2.77	20.01	0.51	1.8	0.00	***-4.48***	11.00	15.48	***-2.68***	17.00	19.68

Sample Calculation:
PSD: Power Spectral Density
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain
Although the EUT operates on Master mode, more stringent limit for Client device was applied. (W52 for FCC)

Maximum Power Spectral Density

11a	11ac-20
5180 MHz	5180 MHz
	
5220 MHz	5220 MHz
	
5240 MHz	5240 MHz
	

Maximum Power Spectral Density

11ac-40	11ac-80
5190 MHz	5210 MHz
	
5230 MHz	
	

Radiated Spurious Emission

Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.1
Date	August 31, 2023	September 1, 2023	September 3, 2023	October 4, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH	23 deg. C / 50 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)	Junya Okuno (Band-edge)
Mode	Tx 11a 5180 MHz			

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	5150.0	60.6	45.5	32.1	6.4	35.6	0.3	63.5	48.6	73.9	53.9	10.4	5.3	*1)
Hori.	10360.0	41.6	-	40.0	-2.7	33.1	-	45.8	-	68.2	-	22.4	-	Floor noise
Hori.	15540.0	42.7	-	37.7	-0.6	32.2	-	47.6	-	68.2	-	20.6	-	Floor noise
Vert.	5150.0	60.3	45.1	32.1	6.4	35.6	0.3	63.2	48.3	73.9	53.9	10.7	5.7	*1)
Vert.	10360.0	41.3	-	40.0	-2.7	33.1	-	45.5	-	68.2	-	22.7	-	Floor noise
Vert.	15540.0	41.9	-	37.7	-0.6	32.2	-	46.8	-	68.2	-	21.4	-	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

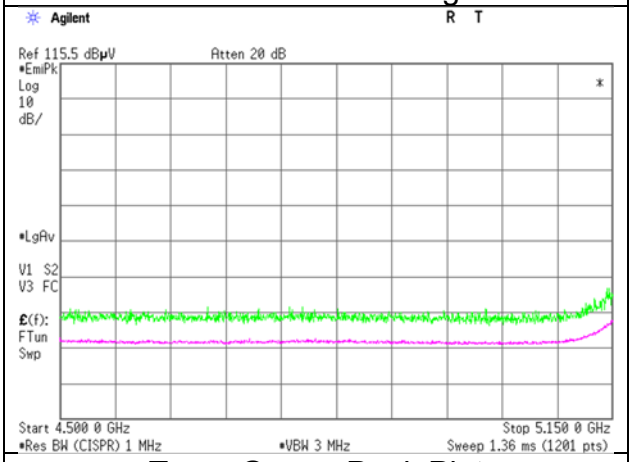
Distance factor:	1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
	10 GHz - 40 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 4, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Junya Okuno
	(Band-edge)
Mode	Tx 11a 5180 MHz

Horizontal

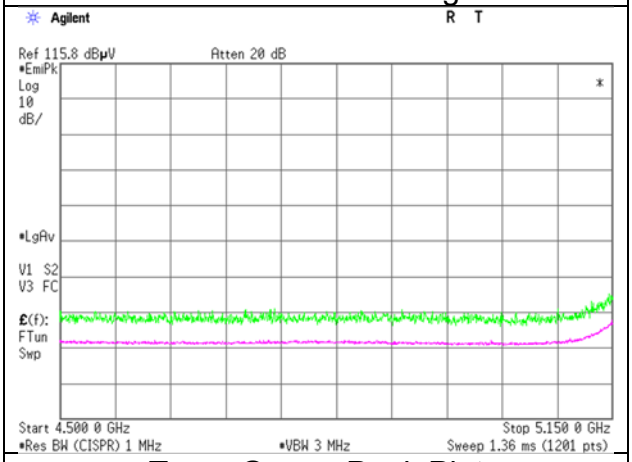
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	August 31, 2023	September 1, 2023	September 3, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH
Engineer	Daiki Matsui	Yuta Moriya	Yuta Moriya
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(Above 18 GHz)
Mode	Tx 11a 5220 MHz		

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	10440.0	42.4	-	40.0	-2.6	33.1	-	46.6	-	68.2	-	21.6	-	Floor noise
Hori.	15660.0	42.9	-	37.5	-0.6	32.2	-	47.6	-	68.2	-	20.7	-	Floor noise
Vert.	10440.0	42.0	-	40.0	-2.6	33.1	-	46.2	-	68.2	-	22.0	-	Floor noise
Vert.	15660.0	42.9	-	37.5	-0.6	32.2	-	47.6	-	68.2	-	20.6	-	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

Distance factor:	1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
	10 GHz - 40 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.1
Date	August 31, 2023	September 1, 2023	September 3, 2023	October 4, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH	23 deg. C / 50 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)	Junya Okuno (Band-edge)
Mode	Tx 11a 5240 MHz			

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	5350.0	45.1	36.5	31.8	6.5	35.6	0.3	47.8	39.4	73.9	53.9	26.1	14.5	*1)
Hori.	10480.0	42.5	-	39.9	-2.6	33.1	-	46.6	-	68.2	-	21.6	-	Floor noise
Hori.	15720.0	42.8	-	37.4	-0.6	32.2	-	47.4	-	68.2	-	20.8	-	Floor noise
Vert.	5350.0	45.2	36.8	31.8	6.5	35.6	0.3	47.8	39.7	73.9	53.9	26.1	14.2	*1)
Vert.	10480.0	42.5	-	39.9	-2.6	33.1	-	46.7	-	68.2	-	21.5	-	Floor noise
Vert.	15720.0	42.6	-	37.4	-0.6	32.2	-	47.2	-	68.2	-	21.0	-	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

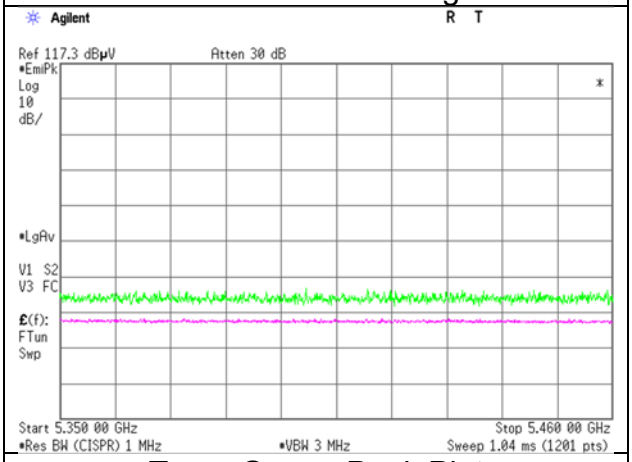
Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 4, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Junya Okuno
	(Band-edge)
Mode	Tx 11a 5240 MHz

Horizontal

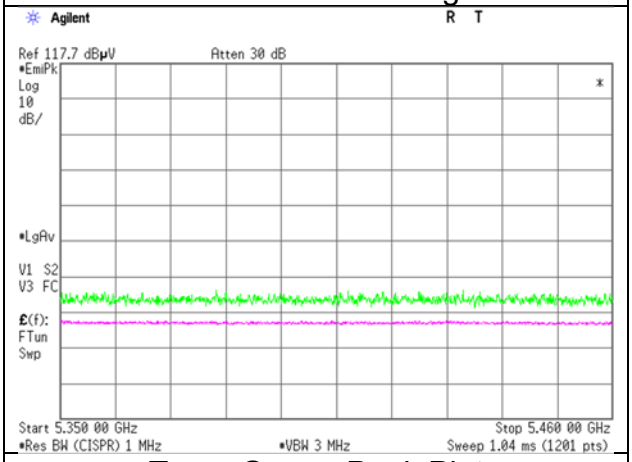
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.1
Date	August 31, 2023	September 1, 2023	September 3, 2023	October 4, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH	23 deg. C / 50 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)	Junya Okuno (Band-edge)
Mode	Tx 11ac-20 5180 MHz			

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	5150.0	61.5	45.5	32.1	6.4	35.6	0.3	64.4	48.7	73.9	53.9	9.5	5.2	*1)
Hori.	10360.0	42.9	-	40.0	-2.7	33.1	-	47.1	-	68.2	-	21.1	-	Floor noise
Hori.	15540.0	42.7	-	37.7	-0.6	32.2	-	47.6	-	68.2	-	20.6	-	Floor noise
Vert.	5150.0	62.6	45.8	32.1	6.4	35.6	0.3	65.5	49.1	73.9	53.9	8.5	4.9	*1)
Vert.	10360.0	42.6	-	40.0	-2.7	33.1	-	46.9	-	68.2	-	21.3	-	Floor noise
Vert.	15540.0	42.8	-	37.7	-0.6	32.2	-	47.7	-	68.2	-	20.5	-	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

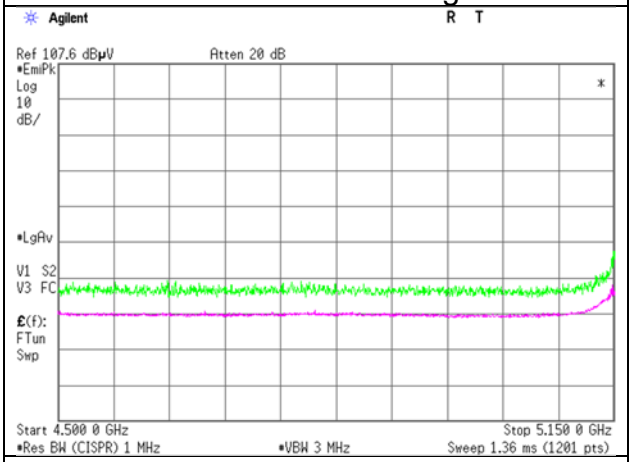
Distance factor:	1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
	10 GHz - 40 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 4, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Junya Okuno
	(Band-edge)
Mode	Tx 11ac-20 5180 MHz

Horizontal

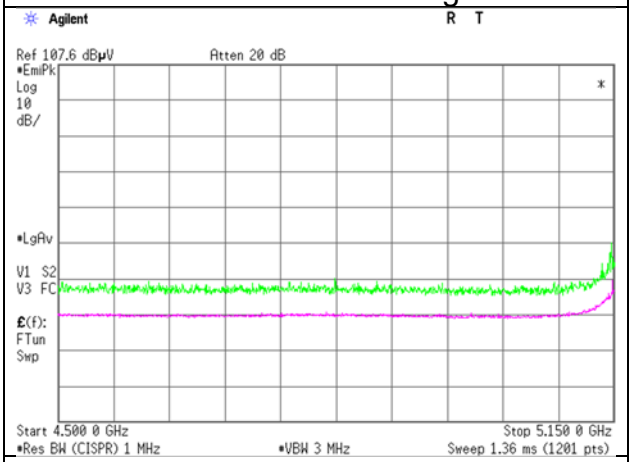
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	August 31, 2023	September 1, 2023	September 3, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH
Engineer	Daiki Matsui	Yuta Moriya	Yuta Moriya
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(Above 18 GHz)
Mode	Tx 11ac-20 5220 MHz		

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	10440.0	42.5	-	40.0	-2.6	33.1	-	46.7	-	68.2	-	21.5	-	Floor noise
Hori.	15660.0	42.0	-	37.5	-0.6	32.2	-	46.7	-	68.2	-	21.5	-	Floor noise
Vert.	10440.0	42.6	-	40.0	-2.6	33.1	-	46.8	-	68.2	-	21.4	-	Floor noise
Vert.	15660.0	42.8	-	37.5	-0.6	32.2	-	47.5	-	68.2	-	20.7	-	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

Distance factor:	1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
	10 GHz - 40 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.1
Date	August 31, 2023	September 1, 2023	September 3, 2023	October 4, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH	23 deg. C / 50 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)	Junya Okuno (Band-edge)
Mode	Tx 11ac-20 5240 MHz			

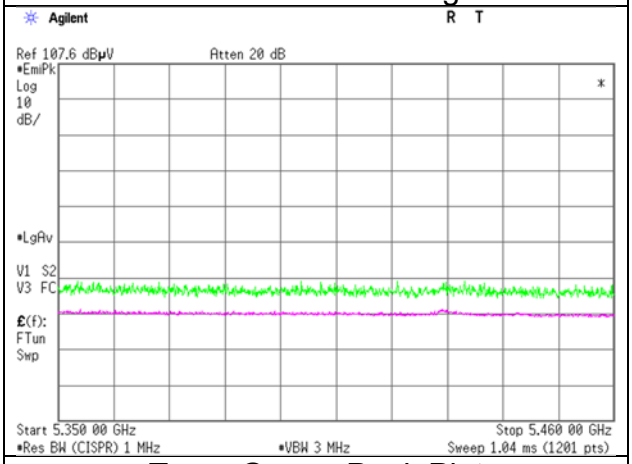
Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	5350.0	45.4	36.6	31.8	6.5	35.6	0.3	48.1	39.6	73.9	53.9	25.8	14.3	*1)
Hori.	10480.0	42.4	-	39.9	-2.6	33.1	-	46.6	-	68.2	-	21.6	-	Floor noise
Hori.	15720.0	43.0	-	37.4	-0.6	32.2	-	47.5	-	68.2	-	20.7	-	Floor noise
Vert.	5350.0	45.5	36.8	31.8	6.5	35.6	0.3	48.2	39.8	73.9	53.9	25.7	14.1	*1)
Vert.	10480.0	42.6	-	39.9	-2.6	33.1	-	46.8	-	68.2	-	21.4	-	Floor noise
Vert.	15720.0	42.3	-	37.4	-0.6	32.2	-	46.9	-	68.2	-	21.3	-	Floor noise

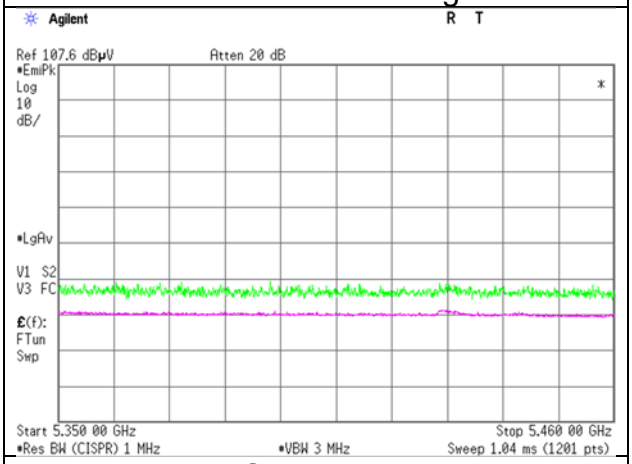
Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

Distance factor:	1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
	10 GHz - 40 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 4, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Junya Okuno
	(Band-edge)
Mode	Tx 11ac-20 5240 MHz

Horizontal
Restricted-band band-edge Plot

Trace Green: Peak Plot Trace Purple: Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green: Peak Plot Trace Purple: Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.1
Date	August 31, 2023	September 1, 2023	September 3, 2023	October 4, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH	23 deg. C / 50 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)	Junya Okuno (Band-edge)
Mode	Tx 11ac-40 5190 MHz			

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	5150.0	63.1	47.4	32.1	6.4	35.6	-	66.0	50.3	73.9	53.9	7.9	3.6	*2)
Hori.	10380.0	42.6	-	40.0	-2.7	33.1	-	46.9	-	68.2	-	21.3	-	Floor noise
Hori.	15570.0	42.9	-	37.7	-0.6	32.2	-	47.8	-	68.2	-	20.4	-	Floor noise
Vert.	5150.0	63.2	47.8	32.1	6.4	35.6	-	66.1	50.7	73.9	53.9	7.8	3.2	*2)
Vert.	10380.0	42.5	-	40.0	-2.7	33.1	-	46.7	-	68.2	-	21.5	-	Floor noise
Vert.	15570.0	42.7	-	37.7	-0.6	32.2	-	47.5	-	68.2	-	20.7	-	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

*2) Integration method (AV only)

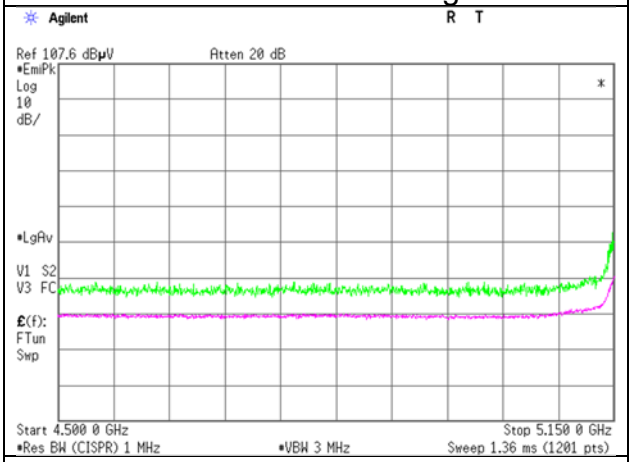
Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 4, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Junya Okuno
	(Band-edge)
Mode	Tx 11ac-40 5190 MHz

Horizontal

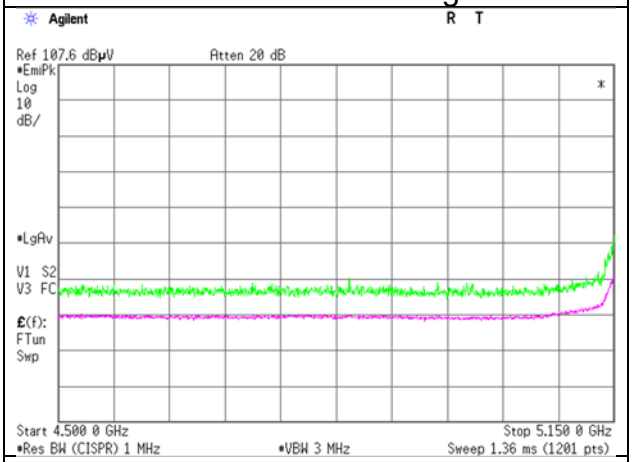
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	August 31, 2023	September 1, 2023	September 3, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)
Mode	Tx 11ac-40 5230 MHz		

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.1
Date	September 4, 2023	October 4, 2023
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 50 % RH
Engineer	Yuta Moriya (Below 1 GHz)	Junya Okuno (Band-edge)
Mode	Tx 11ac-40 5230 MHz	

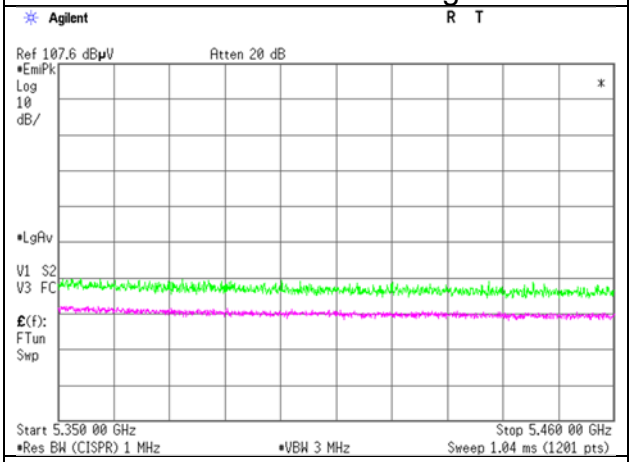
Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	812.2	20.8	-	20.9	13.2	31.3	-	23.6	-	68.2	-	44.6	-	Floor noise
Hori.	838.8	20.5	-	21.3	13.4	31.2	-	24.0	-	68.2	-	44.2	-	Floor noise
Hori.	863.1	20.4	-	21.7	13.5	31.0	-	24.6	-	68.2	-	43.6	-	Floor noise
Hori.	888.9	20.0	-	22.1	13.6	30.9	-	24.8	-	68.2	-	43.4	-	Floor noise
Hori.	913.4	19.8	-	22.2	13.7	30.8	-	25.0	-	68.2	-	43.2	-	Floor noise
Hori.	938.2	19.8	-	22.0	13.9	30.6	-	25.0	-	68.2	-	43.2	-	Floor noise
Hori.	5350.0	48.0	38.8	31.8	6.5	35.6	-	50.7	41.4	73.9	53.9	23.2	12.5	
Hori.	10460.0	42.3	-	39.9	-2.6	33.1	-	46.5	-	68.2	-	21.7	-	Floor noise
Hori.	15690.0	42.9	-	37.4	-0.6	32.2	-	47.5	-	68.2	-	20.7	-	Floor noise
Vert.	812.2	20.9	-	20.9	13.2	31.3	-	23.7	-	68.2	-	44.5	-	Floor noise
Vert.	838.8	20.6	-	21.3	13.4	31.2	-	24.1	-	68.2	-	44.1	-	Floor noise
Vert.	863.1	20.4	-	21.7	13.5	31.0	-	24.6	-	68.2	-	43.6	-	Floor noise
Vert.	888.9	20.2	-	22.1	13.6	30.9	-	25.0	-	68.2	-	43.2	-	Floor noise
Vert.	913.4	20.0	-	22.2	13.7	30.8	-	25.2	-	68.2	-	43.0	-	Floor noise
Vert.	938.2	19.9	-	22.0	13.9	30.6	-	25.1	-	68.2	-	43.1	-	Floor noise
Vert.	5350.0	47.4	38.7	31.8	6.5	35.6	-	50.1	41.3	73.9	53.9	23.8	12.6	
Vert.	10460.0	42.4	-	39.9	-2.6	33.1	-	46.5	-	68.2	-	21.7	-	Floor noise
Vert.	15690.0	42.7	-	37.4	-0.6	32.2	-	47.2	-	68.2	-	21.0	-	Floor noise

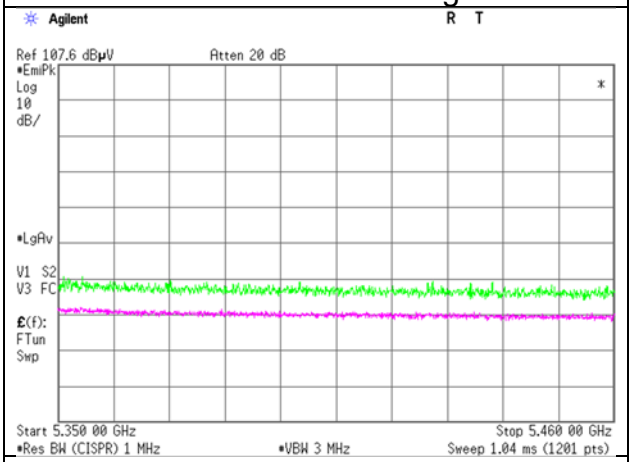
Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.

Distance factor:	1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
	10 GHz - 40 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 4, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Junya Okuno
	(Band-edge)
Mode	Tx 11ac-40 5230 MHz

Horizontal
Restricted-band band-edge Plot

Trace Green: Peak Plot Trace Purple: Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green: Peak Plot Trace Purple: Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.1
Date	August 31, 2023	September 1, 2023	September 3, 2023	October 4, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH	23 deg. C / 50 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)	Junya Okuno (Band-edge)
Mode	Tx 11ac-80 5210 MHz			

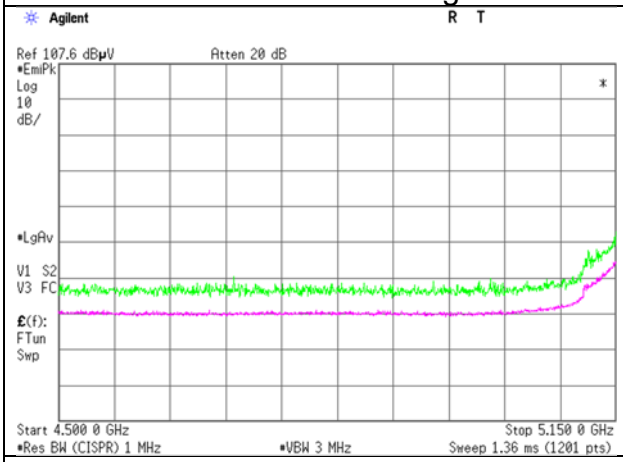
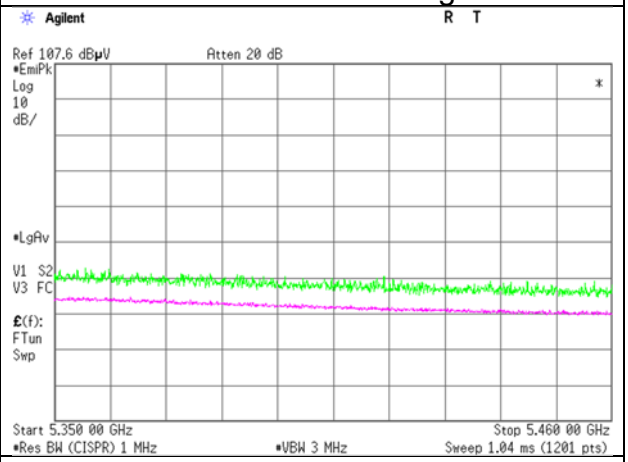
Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	5150.0	61.5	49.5	32.1	6.4	35.6	0.5	64.3	52.9	73.9	53.9	9.6	1.1	*1),*2)
Hori.	5350.0	50.4	40.9	31.8	6.5	35.6	0.5	53.0	44.1	73.9	53.9	20.9	9.8	*1)
Hori.	10420.0	42.3	-	40.0	-2.6	33.1	-	46.6	-	68.2	-	21.7	-	Floor noise
Hori.	15630.0	42.1	-	37.6	-0.6	32.2	-	46.8	-	68.2	-	21.4	-	Floor noise
Vert.	5150.0	61.5	49.5	32.1	6.4	35.6	0.5	64.4	52.9	73.9	53.9	9.5	1.0	*1),*2)
Vert.	5350.0	50.7	41.5	31.8	6.5	35.6	0.5	53.3	44.6	73.9	53.9	20.6	9.3	*1)
Vert.	10420.0	42.7	-	40.0	-2.6	33.1	-	47.0	-	68.2	-	21.3	-	Floor noise
Vert.	15630.0	42.9	-	37.6	-0.6	32.2	-	47.7	-	68.2	-	20.5	-	Floor noise

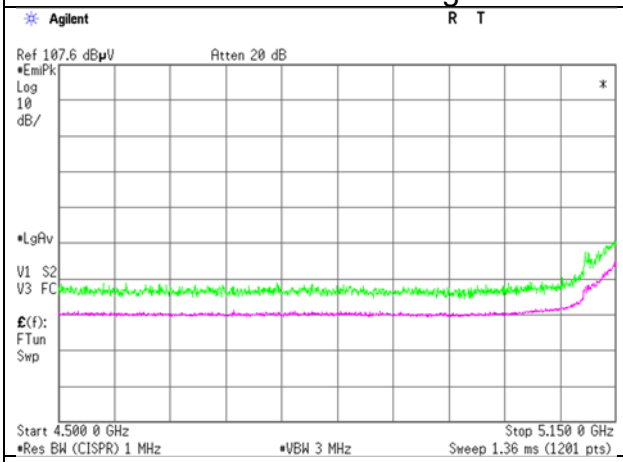
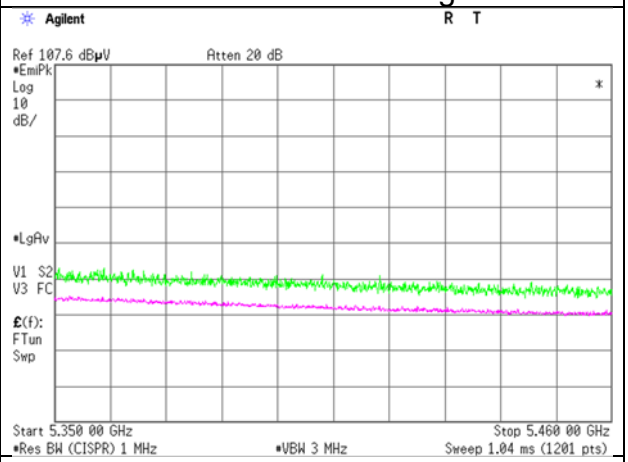
Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)
*2) Integration method (AV only)

Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 4, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Junya Okuno
	(Band-edge)
Mode	Tx 11ac-80 5210 MHz

Horizontal	Horizontal
Restricted-band band-edge Plot	Restricted-band band-edge Plot
	
Trace Green: Peak Plot Trace Purple: Average Plot	Trace Green: Peak Plot Trace Purple: Average Plot

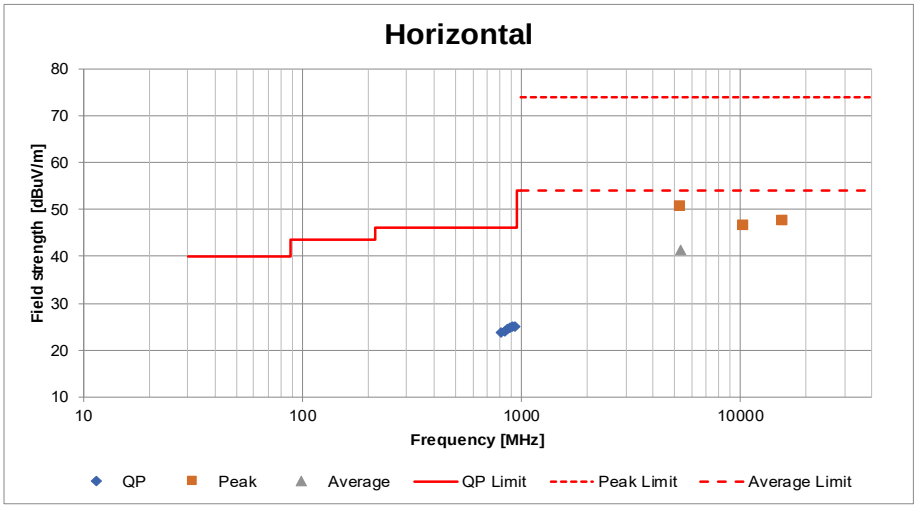
Vertical	Vertical
Restricted-band band-edge Plot	Restricted-band band-edge Plot
	
Trace Green: Peak Plot Trace Purple: Average Plot	Trace Green: Peak Plot Trace Purple: Average Plot

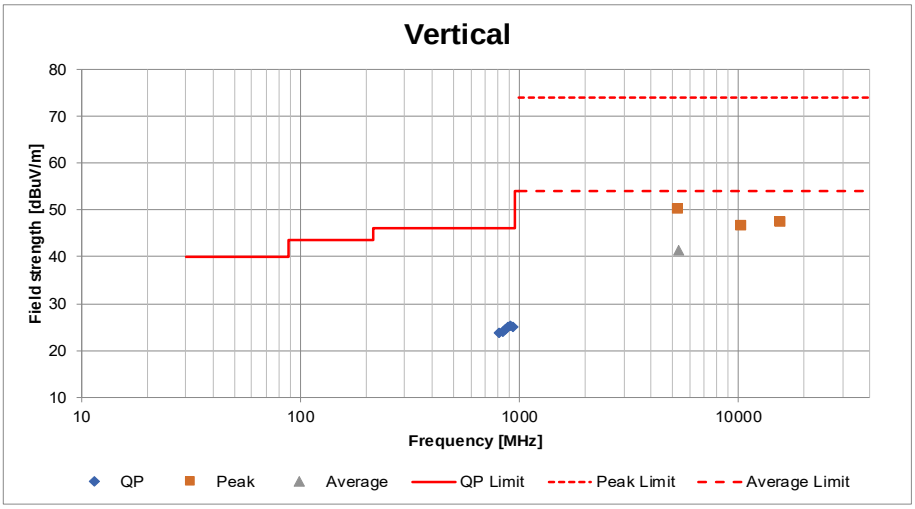
* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case mode for Maximum Conducted Output Power)

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	August 31, 2023	September 1, 2023	September 3, 2023
Temperature / Humidity	21 deg. C / 44 % RH	22 deg. C / 58 % RH	21 deg. C / 42 % RH
Engineer	Daiki Matsui (1 GHz to 10 GHz except band-edge)	Yuta Moriya (10 GHz to 18 GHz)	Yuta Moriya (Above 18 GHz)
Mode	Tx 11ac-40 5230 MHz		

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.1	
Date	September 4, 2023	October 4, 2023	
Temperature / Humidity	22 deg. C / 61 % RH	23 deg. C / 50 % RH	
Engineer	Yuta Moriya (Below 1 GHz)	Junya Okuno (Band-edge)	
Mode	Tx 11ac-40 5230 MHz		



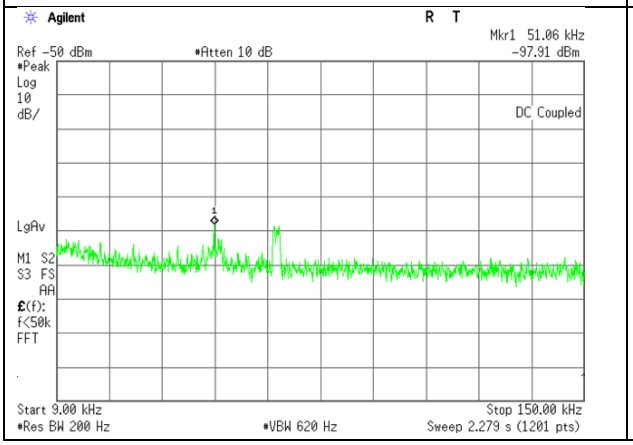


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

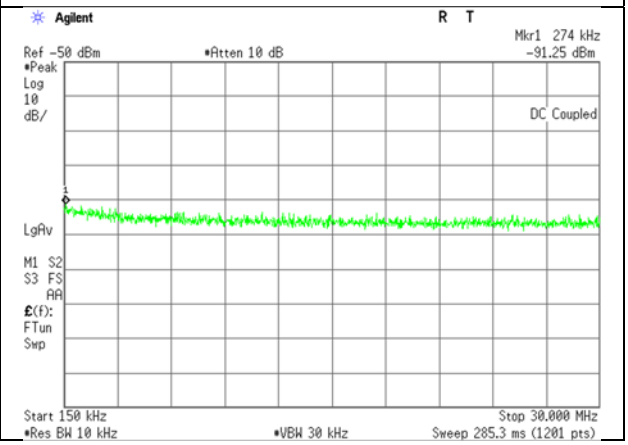
Conducted Spurious Emission

Test place	Ise EMC Lab. No.8 Measurement Room
Date	August 30, 2023
Temperature / Humidity	20 deg. C / 61 % RH
Engineer	Tetsuro Yoshida
Mode	Tx 11ac-40 5230 MHz

9 kHz to 150 kHz



150 kHz to 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
51.06	-97.9	0.01	9.8	2.0	1	-86.1	300	6.0	-24.8	33.4	58.2	
274.00	-91.3	0.01	9.8	2.0	1	-79.4	300	6.0	-18.1	18.8	36.9	

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

*2.0 dBi was applied to the test result based on KDB 789033 since antenna gain was less than 2.0 dBi.

APPENDIX 2: Test Instruments

Test Equipment (1/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	MAT-10	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/10/2022	12
AT	MAT-21	141174	Attenuator(20dB) (above1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-120	901247	01/20/2023	12
AT	MCC-144	141414	Microwave Cable	Junkosha	MWX221	1207S407	08/01/2023	12
AT	MCC-235	184488	Microwave Cable	Murata Manufacturing Company, Ltd.	MXHS83QE3000	-	09/27/2022	12 *1)
AT	MCC-244	197219	Microwave cable	Huber+Suhner	SF126E/11PC35/11PC35/2000MM	536999/126E	03/09/2023	12
AT	MCC-38	141395	Coaxial Cable	UL Japan	-	-	11/18/2022	12
AT	MMM-17	141557	DIGIITAL HiTESTER	HIOKI E.E. CORPORATION	3805	70900530	01/18/2023	12
AT	MOS-28	141567	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0008	01/13/2023	12
AT	MPM-19	141815	Power Meter	Raditeq (Formerly DARE!! Instruments)	RPR3006W	14I00048SNO083	10/21/2022	12
AT	MSA-13	141900	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185823	06/16/2023	12
AT	MSA-14	141901	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY48250080	01/16/2023	12
CE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
CE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/30/2022	24
CE	MAT-64	141290	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/22/2022	12
CE	MCC-13	141222	Coaxial Cable	Fujikura,HP,Mini-Circits,Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	02/01/2023	12
CE	MJM-27	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
CE	MLS-25	141537	LISN(AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-731	07/21/2023	12
CE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/01/2023	12
CE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/17/2022	12
CE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	04/10/2023	12
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-01-SVSWR	141994	AC1_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 10m	DA-06881	04/20/2023	24
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/23/2022	24
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2023	24
RE	MAT-95	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/23/2023	12
RE	MCC-177	141226	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S304	03/03/2023	12
RE	MCC-217	141393	Microwave Cable	Junkosha	MWX221	1604S254(1 m) / 1608S088(5 m)	08/01/2023	12
RE	MCC-224	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	10/19/2022	12
RE	MCC-265	234602	Microwave Cable	Huber+Suhner	SF126E/11PC35/ 11PC35/ 1000M, 5000M	537063/126E / 537074/126E	03/16/2023	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	09/10/2023	12

Test Equipment (2/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MHA-16	141513	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170306	07/19/2023	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/14/2022	12
RE	MHA-21	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	557	05/17/2023	12
RE	MHA-29	141517	Horn Antenna 26.5-40GHz	ETS-Lindgren	3160-10	152399	11/14/2022	12
RE	MHF-22	141293	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCB	602	02/01/2023	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	10/03/2022	12
RE	MJM-25	142226	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	MLA-22	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/10/2023	12
RE	MMM-03	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	01/18/2023	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201197	01/17/2023	12
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	01/13/2023	12
RE	MOS-27	141566	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	A08Q26	01/13/2023	12
RE	MPA-01	141576	Pre Amplifier	Keysight Technologies Inc	8449B	3008A01671	02/14/2023	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/08/2023	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/07/2023	12
RE	MPA-22	141588	Pre Amplifier	L3 Narda-MITEQ	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 / 1871328	01/24/2023	12
RE	MSA-16	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	01/16/2023	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	04/10/2023	12
RE	YBA-03	197990	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHBB 9124 + BBA 9106	01365	11/12/2022	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.

The expiration*1) This test equipment was used for the tests before the expiration date of the calibration.

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

Test item:

AT: Antenna Terminal Conducted test
CE: Conducted Emission
RE: Radiated Emission