RADIO TEST REPORT

Test Report No. : 13211388S-H

Applicant	:	**Nintendo Co., Ltd.**
Type of EUT	:	**Development tool**
Model Number of EUT	:	**HAT-002 (-01)**
FCC ID	:	**BKEHAT002**
Test regulation	:	**FCC Part 15 Subpart E: 2020** **For Permissive Change** **(Radiated Spurious Emission tests only)** *Wireless LAN 5 GHz band part
Test Result	:	**Complied (Refer to SECTION 3.2)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
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6. This test report covers Radio technical requirements.
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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.

Date of test: February 4 to 27, 2020

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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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REVISION HISTORY

Original Test Report No.: 13211388S-H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13211388S-H	June 23, 2020	-	-

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	:	Nintendo Co., Ltd.
Address	:	11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto 601-8501, Japan
Telephone Number	:	+81-75-662-9600
Facsimile Number	:	+81-75-662-9624
Contact Person	:	Kazuya Kuramoto

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)
- 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 of Equipment	:	Development tool
Model No.	:	HAT-002 (-01)
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 3.7 V (battery), AC Adapter input: AC 100 V – 240 V, 50 Hz / 60 Hz, 1 A, AC Adapter output: DC 5 V – DC 15 V, 2.6 A
Receipt Date of Sample (Information from test lab.)	:	February 3, 2020
Country of Mass-production	:	China
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: HAT-002 (-01) (referred to as the EUT in this report) is a Development tool.

General Specification

Clock frequency(ies) in the system	:	37.4 MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	Wireless LAN part: 2412 MHz - 2472 MHz, U-NII-1: 5180 MHz - 5240 MHz, U-NII-2A: 5260 MHz - 5320 MHz, Bluetooth part: 2402 MHz - 2480 MHz
Modulation	:	Wireless LAN part: 2.4 GHz bands: DBPSK, DQPSK, CCK, OFDM 5 GHz bands: OFDM Bluetooth part: BDR (Baisc Data Rate): GFSK EDR (Enhanced Data Rate): π/4-DQPSK, 8DPSK LE (Low Energy mode): GFSK
Antenna type	:	PCB Antenna (Dipole)
Antenna connector	:	(Ant: 0): MHF 4L, (Ant: 1): MHF II
Antenna Gain	:	2.4 GHz band: -0.70 dBi max (ANT0: Wireless LAN & Bluetooth), -8.38 dBi max (ANT1: Wireless LAN) 5 GHz band: +3.31 dBi max (ANT0: Wireless LAN), -0.96 dBi max (ANT1: Wireless LAN)
Operation temperature	:	+5 deg.C to +35 deg.C

Remarks: This Wireless Module consists of 1 chip each of 5 GHz band and 2.4 GHz band.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E
FCC Part 15 final revised on May 26, 2020 and effective July 27, 2020 except 15.258

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

* The revision does not affect the test result conducted before its effective date.

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edge	**FCC:** ANSI C63.10-2013 KDB Publication Number 789033	**FCC:** 15.407 (b), 15.205 and 15.209	0.9 dB 5350.000 MHz, AV, Vert. Mode: Tx 11n-40 5310 MHz, SISO	Complied# a)	Conducted (< 30 MHz) / Radiated (> 30 MHz) *1)
	ISED: -	**ISED:** RSS-247 6.2.1.2 6.2.2.2 6.2.3.2 6.2.4.2			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) Radiated test was selected over 30 MHz based on FCC 15.407 (b) and KDB 789033 D02 G.3.b). 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 stable voltage constantly to RF Part regardless of input voltage. Therefore, the EUT complies with the requirement.

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

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %
Temperature	0.95 deg.C.
Voltage	0.83 %

3.5 Test Location

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Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Test item	Mode	Tested frequency	Worst data rate *2)	Antenna *2)
Radiated emission (below 1 GHz) *1)	Transmitting, IEEE 802.11ac-20, SISO	5260 MHz	MCS 3, PN9	0
Radiated emission (above 1 GHz) *3)	Transmitting, IEEE 802.11ac VHT20, SISO	Low bands: 5180 MHz, 5240 MHz, Middle bands: 5260 MHz, 5320 MHz	MCS 3, PN9	0
	Transmitting, IEEE 802.11n HT20, MIMO *4)	Low bands: 5180 MHz Middle bands: 5320 MHz	MCS 11, PN9	0 & 1
	Transmitting, IEEE 802.11n HT40, SISO	Low bands: 5190 MHz, 5230 MHz, Middle bands: 5310 MHz	MCS 3, PN9	0
	Transmitting, IEEE 802.11n HT40, MIMO *4)	Low bands: 5190 MHz Middle bands: 5310 MHz	MCS 11, PN9	0 & 1
	Transmitting, IEEE 802.11ac VHT80, SISO	Low bands: 5210 MHz, Middle bands: 5290 MHz	MCS 3, PN9	0
	Transmitting, IEEE 802.11ac VHT80, MIMO *4)	Low bands: 5210 MHz, Middle bands: 5290 MHz	MCS 3, PN9	0 & 1

*Power of the EUT was set by the software as follows;
Power settings: Fixed (refer to power setting table)
Software: cmd.exe, Ver. 6.3.960017415 (Date: 2020.2.4, Storage location: Driven by connected PC)

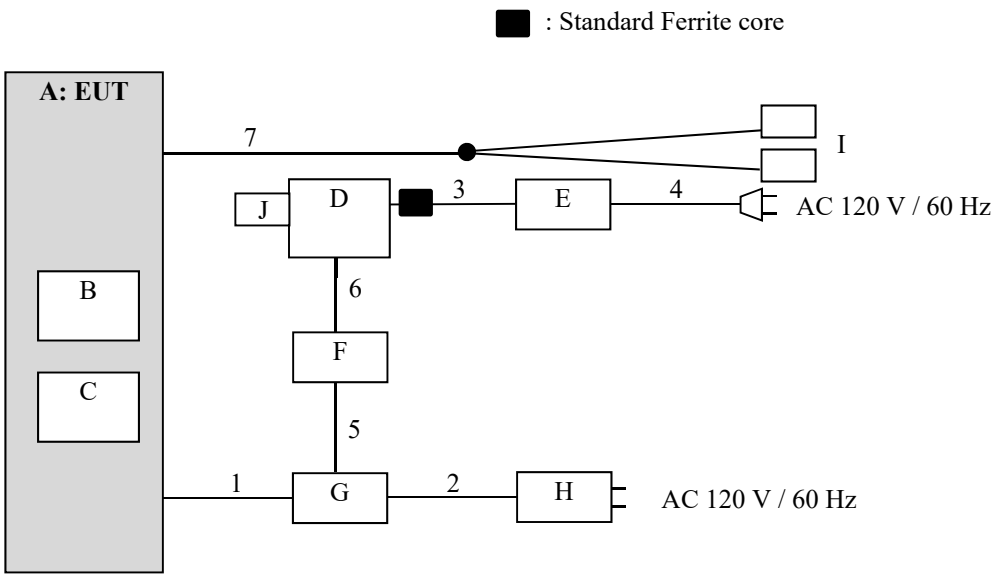
*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.

*1) 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 OFDM VHT mode by the pre-test.
*2) The worst condition was determined based on the test result of Maximum Peak Output Power of original report.
*3) Since 11a, 11n and 11ac mode have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest radiated carrier power.
*4) This mode wasn't worst, but only band edge of spurious emissions were measured for confirmation.

Power setting (target power) table

Bandwidth	Channel frequency	Mode	Rate / MCS mode [dBm]									
20 MHz	5180 MHz – 5240 MHz	11a	6 M	9 M	12 M	18 M	24 M	36 M	48 M	54 M	-	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-
	5180 MHz – 5240 MHz	11n-20 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-
	5180 MHz – 5240 MHz	11n-20 (MIMO)	MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	-	-
	5180 MHz – 5240 MHz	11ac-20 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.0	-
	5180 MHz – 5240 MHz	11ac-20 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	-
40 MHz	5190 MHz	11n-40 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	-	-
	5230 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-
	5190 MHz	11n-40 (MIMO)	MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	-	-
	5230 MHz		MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	-	-
	5190 MHz	11ac-40 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	5230 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.0	13.0
	5190 MHz	11ac-40 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
	5230 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
80 MHz	5210 MHz	11ac-80 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
	5210 MHz	11ac-80 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
20 MHz	5260 MHz – 5320 MHz	11a	6 M	9 M	12 M	18 M	24 M	36 M	48 M	54 M	-	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-
	5260 MHz – 5320 MHz	11n-20 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-
	5260 MHz – 5320 MHz	11n-20 (MIMO)	MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	-	-
	5260 MHz – 5320 MHz	11ac-20 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.0	-
	5260 MHz – 5320 MHz	11ac-20 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	-
40 MHz	5270 MHz – 5310 MHz	11n-40 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-
	5270 MHz – 5310 MHz	11n-40 (MIMO)	MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	-	-
	5270 MHz – 5310 MHz	11ac-40 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.0	13.0
	5270 MHz – 5310 MHz	11ac-40 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
80 MHz	5290 MHz	11ac-80 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
	5290 MHz	11ac-80 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

4.2 Configuration and peripherals



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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Development tool	HAT-002 (-01)	XAL00710001144	Nintendo	EUT
B	Game Card	HAC-008	NX32GB-01282	Nintendo	-
C	Micro SDHC Card	8GB	-	PQI	-
D	Laptop PC	CF-S10AWNDS	1EKSA54822	Panasonic	-
E	AC Adapter	CF-AA6402A M1	-	Panasonic	-
F	GIGA Ethernet Adapter	LAN-GTJU3	67L349603587A	Logitec	-
G	SDEV Cradle	HAT-003	XZL01000079874	Nintendo	-
H	AC Adapter	HAC-002	2407171-4	Nintendo	-
I	Headphone	-	-	Nintendo	-
J	USB-UART adaptor	TTL-232RG	-	FTDI	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	0.4	Shielded	Shielded	-
2	USB	1.5	Shielded	Shielded	-
3	DC	1.0	Unshielded	Unshielded	-
4	AC	0.8	Unshielded	Unshielded	-
5	USB	0.1	Shielded	Shielded	-
6	LAN	1.0	Unshielded	Unshielded	-
7	Headphone	0.5 + 0.3	Shielded	Shielded	-

SECTION 5: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

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

< Above 1GHz >
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.

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

< Above 1GHz >
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).

Restricted band edge:
Apply to limit in the Section 15.209 (a).
Since this limit is severer than the limit of the inside of restricted bands.

*Electric field strength to e.i.r.p. conversion:

$$E = \frac{1000000\sqrt{30P}}{3} \text{ (uV/m)}$$

:P is the e.i.r.p. (Watts)

Test Antennas are used as below;

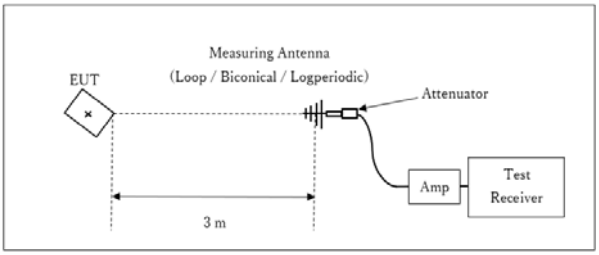
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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 VB *1) RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak Trace: Max Hold

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

Figure 1: Test Setup

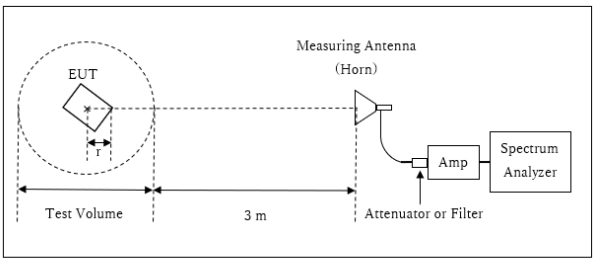
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz

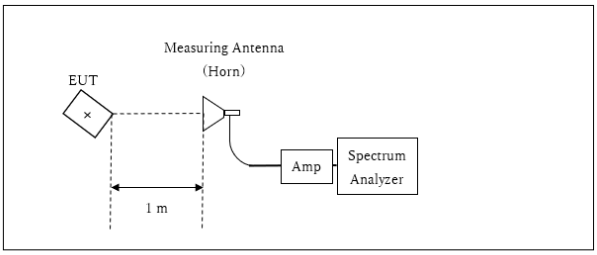


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.9 m / 3.0 m) = 2.28 dB
* Test Distance: (3 + Test Volume /2) - r = 3.9 m

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.1 m

13 GHz – 40 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 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.

Mode	Antenna polarization	Carrier	Spurious (Below 1 GHz)	Spurious (1 GHz – 6.4 GHz)	Spurious (6.4 GHz - 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (Above 18 GHz)
SISO	Horizontal	X	X	X	X	Z	X
	Vertical	Y	Y	Y	Y	X	X
MIMO	Horizontal	X	-	-	-	-	-
	Vertical	Y	-	-	-	-	-

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

Measurement range : 30 MHz - 40 GHz
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Radiated Spurious Emission

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.2	No.2	No.3	No.3	No.3
Date	February 8, 2020	February 8, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	22 deg. C / 35 % RH	22 deg. C / 35 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)	Makoto Hosaka (6.4 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)	Makoto Hosaka (26.5 GHz -40 GHz)
Mode	Tx 11ac-20 5180 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	5150.000	PK	52.03	32.69	16.07	38.63	2.28	64.44	73.9	9.4	123	162	
Hori.	15540.000	PK	57.65	39.01	11.50	40.79	-9.54	57.83	73.9	16.0	154	346	
Hori.	5150.000	AV	36.94	32.69	16.07	38.63	2.28	49.35	53.9	**4.5**	123	162	VBW:2.7 kHz
Hori.	15540.000	AV	46.84	39.01	11.50	40.79	-9.54	47.02	53.9	6.8	154	346	VBW:2.7 kHz
Vert.	5150.000	PK	51.71	32.69	16.07	38.63	2.28	64.12	73.9	9.7	100	225	
Vert.	15540.000	PK	54.59	39.01	11.50	40.79	-9.54	54.77	73.9	19.1	172	222	
Vert.	5150.000	AV	36.68	32.69	16.07	38.63	2.28	49.09	53.9	4.8	100	225	VBW:2.7 kHz
Vert.	15540.000	AV	44.39	39.01	11.50	40.79	-9.54	44.57	53.9	9.3	172	222	VBW:2.7 kHz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	10360.000	PK	44.70	39.52	9.14	39.98	2.28	55.66	-39.56	-27.0	12.5	150	0	
Vert.	10360.000	PK	45.51	39.52	9.14	39.98	2.28	56.47	-38.75	-27.0	**11.7**	150	0	

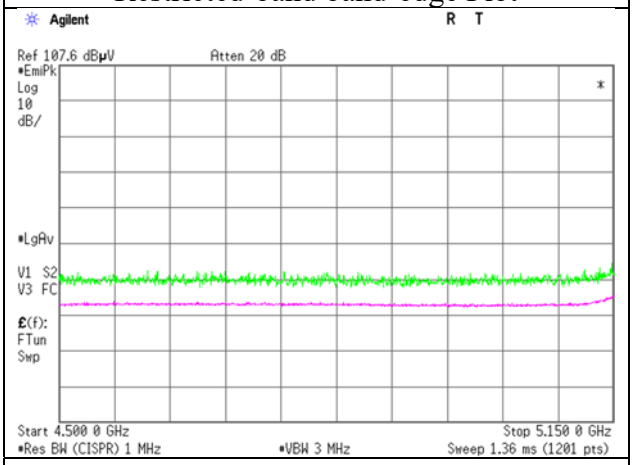
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Resrult(EIRP[dBm])=10*LOG(({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) *10^3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 8, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)
Mode	Tx 11ac-20 5180 MHz SISO

Horizontal

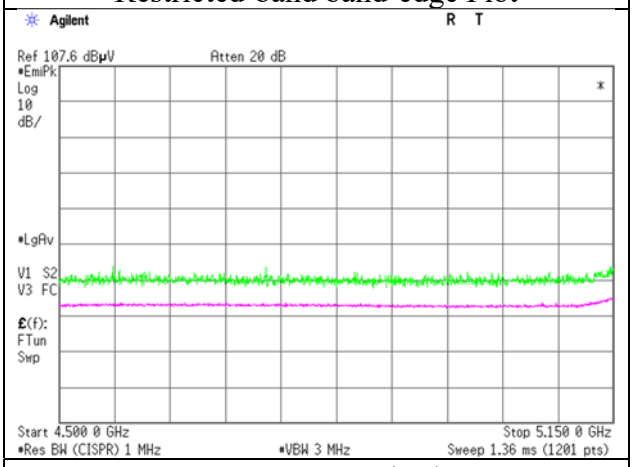
Restricted-band band-edge Plot



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

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3
Date	February 12, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	22 deg. C / 35 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada	Makoto Hosaka
	(1 GHz -6.4 GHz)	(6.4 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11ac-20 5240 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	15720.000	PK	55.38	38.49	11.60	40.60	-9.54	55.33	73.9	18.5	153	146	
Hori.	15720.000	AV	45.12	38.49	11.60	40.60	-9.54	45.07	53.9	**8.8**	153	146	VBW:2.7 kHz
Vert.	15720.000	PK	52.31	38.49	11.60	40.60	-9.54	52.26	73.9	21.6	179	110	
Vert.	15720.000	AV	42.64	38.49	11.60	40.60	-9.54	42.59	53.9	11.3	179	110	VBW:2.7 kHz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	10480.000	PK	47.51	39.56	9.22	42.66	2.28	55.91	-39.31	-27.0	**12.3**	150	0	
Vert.	10480.000	PK	47.15	39.56	9.22	42.66	2.28	55.55	-39.67	-27.0	12.6	150	0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Resrult(EIRP[dBm])=10*LOG （({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) *10^3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H					
Test place	Shonan EMC Lab.					
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3	No.3
Date	February 27, 2020	February 12, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	23 deg. C / 37 % RH	22 deg. C / 35 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Toshinori Yamada (30 MHz - 1000 MHz)	Makoto Hosaka (1 GHz -6.4 GHz)	Makoto Hosaka (6.4 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)	Makoto Hosaka (26.5 GHz -40 GHz)
Mode	Tx 11ac-20 5260 MHz SISO					

(below 1GHz and above 1GHz Inside of the restricted band)

(* 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.	84.782	QP	40.67	7.03	7.62	32.15	0.00	23.17	40.0	16.8	213	287	
Hori.	124.996	QP	35.47	13.40	7.35	32.11	0.00	24.11	43.5	19.3	263	238	
Hori.	249.999	QP	49.67	11.60	8.42	31.99	0.00	37.70	46.0	**8.3**	147	203	
Hori.	344.992	QP	39.86	14.71	9.04	31.94	0.00	31.67	46.0	14.3	145	245	
Hori.	350.006	QP	39.19	14.80	9.07	31.93	0.00	31.13	46.0	14.8	100	269	
Hori.	499.996	QP	41.82	17.48	9.62	31.92	0.00	37.00	46.0	9.0	100	28	
Hori.	953.023	QP	34.77	21.55	11.17	30.61	0.00	36.88	46.0	9.1	100	219	
Hori.	15780.000	PK	55.91	38.41	11.62	40.53	-9.54	55.87	73.9	18.0	156	124	
Hori.	15780.000	AV	45.44	38.41	11.62	40.53	-9.54	45.40	53.9	8.5	156	124	VBW:2.7 kHz
Vert.	37.646	QP	36.43	15.57	6.62	32.17	0.00	26.45	40.0	13.5	100	254	
Vert.	47.267	QP	37.33	12.04	6.79	32.16	0.00	24.00	40.0	16.0	100	123	
Vert.	51.320	QP	39.43	10.61	6.79	32.16	0.00	24.67	40.0	15.3	100	141	
Vert.	87.723	QP	39.20	7.65	7.60	32.14	0.00	22.31	40.0	17.6	100	135	
Vert.	249.999	QP	48.53	11.60	8.42	31.99	0.00	36.56	46.0	9.4	100	61	
Vert.	267.516	QP	44.58	12.42	8.55	31.98	0.00	33.57	46.0	12.4	100	241	
Vert.	345.000	QP	37.43	14.71	9.04	31.94	0.00	29.24	46.0	16.7	203	343	
Vert.	650.025	QP	33.88	18.99	10.17	31.95	0.00	31.09	46.0	14.9	100	158	
Vert.	953.023	QP	29.70	21.55	11.17	30.61	0.00	31.81	46.0	14.1	133	138	
Vert.	15780.000	PK	53.88	38.41	11.62	40.53	-9.54	53.84	73.9	20.0	150	283	
Vert.	15780.000	AV	41.24	38.41	11.62	40.53	-9.54	41.20	53.9	12.7	150	283	VBW:2.7 kHz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	10520.000	PK	46.47	39.64	9.24	42.66	2.28	54.97	-40.25	-27.0	**13.2**	150	0	
Vert.	10520.000	PK	46.30	39.64	9.24	42.66	2.28	54.80	-40.42	-27.0	13.4	156	0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Resrult(EIRP[dBm])=10*LOG （({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) * 10^3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3
Date	February 12, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	22 deg. C / 35 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada	Makoto Hosaka
	(1 GHz -6.4 GHz)	(6.4 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11ac-20 5320 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	5350.000	PK	55.42	31.98	16.27	43.21	2.28	62.74	73.9	11.1	128	151	
Hori.	10640.000	PK	46.57	39.66	9.29	42.67	2.28	55.13	73.9	18.7	150	0	
Hori.	15960.000	PK	57.09	38.31	11.72	40.34	-9.54	57.24	73.9	16.6	146	140	
Hori.	5350.000	AV	40.30	31.98	16.27	43.21	2.28	47.62	53.9	**6.2**	128	151	VBW:2.7 kHz
Hori.	10640.000	AV	36.35	39.66	9.29	42.67	2.28	44.91	53.9	8.9	150	0	VBW:2.7 kHz
Hori.	15960.000	AV	46.10	38.31	11.72	40.34	-9.54	46.25	53.9	7.6	146	140	VBW:2.7 kHz
Vert.	5350.000	PK	55.34	31.98	16.27	43.21	2.28	62.66	73.9	11.2	239	214	
Vert.	10640.000	PK	46.87	39.66	9.29	42.67	2.28	55.43	73.9	18.4	150	0	
Vert.	15960.000	PK	57.06	38.31	11.72	40.34	-9.54	57.21	73.9	16.6	215	118	
Vert.	5350.000	AV	39.80	31.98	16.27	43.21	2.28	47.12	53.9	6.7	239	214	VBW:2.7 kHz
Vert.	10640.000	AV	36.24	39.66	9.29	42.67	2.28	44.80	53.9	9.1	150	0	VBW:2.7 kHz
Vert.	15960.000	AV	45.17	38.31	11.72	40.34	-9.54	45.32	53.9	8.5	215	118	VBW:2.7 kHz

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

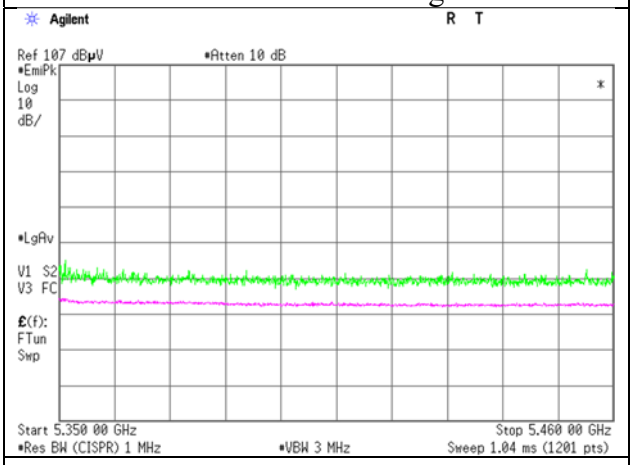
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka
Mode	Tx 11ac-20 5320 MHz SISO

Horizontal

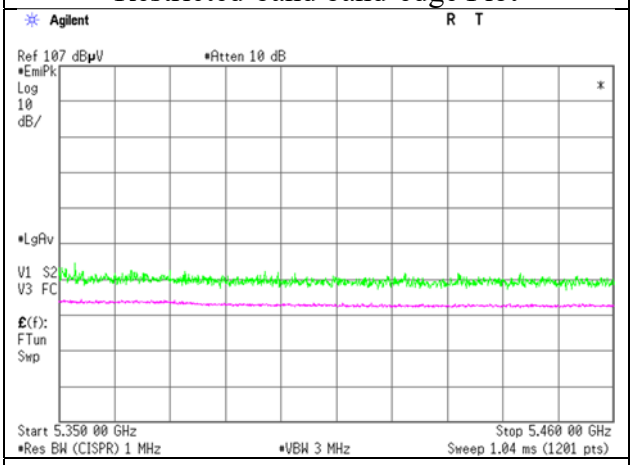
Restricted-band band-edge Plot



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

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)
Mode	Tx 11n-20 5180 MHz MIMO

(above 1GHz Inside of the restricted band)

(* 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.	5150.000	PK	51.55	32.26	16.13	43.04	2.28	59.18	73.9	14.7	189	169	
Hori.	5150.000	AV	40.70	32.26	16.13	43.04	2.28	48.33	53.9	**5.5**	189	169	VBW:5.1 kHz
Vert.	5150.000	PK	50.84	32.26	16.13	43.04	2.28	58.47	73.9	15.4	148	208	
Vert.	5150.000	AV	39.80	32.26	16.13	43.04	2.28	47.43	53.9	6.4	148	208	VBW:5.1 kHz

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

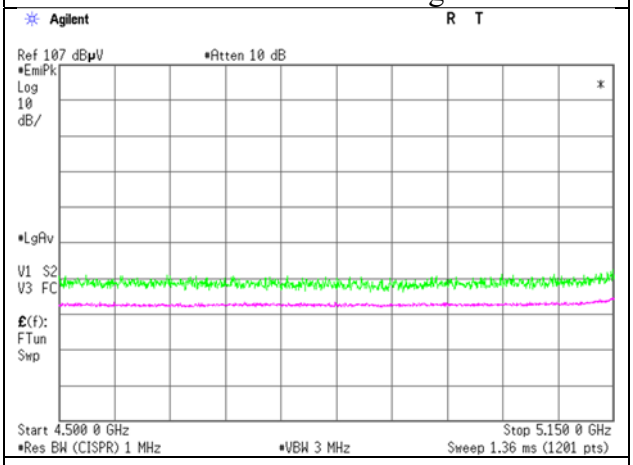
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-20 5180 MHz MIMO

Horizontal

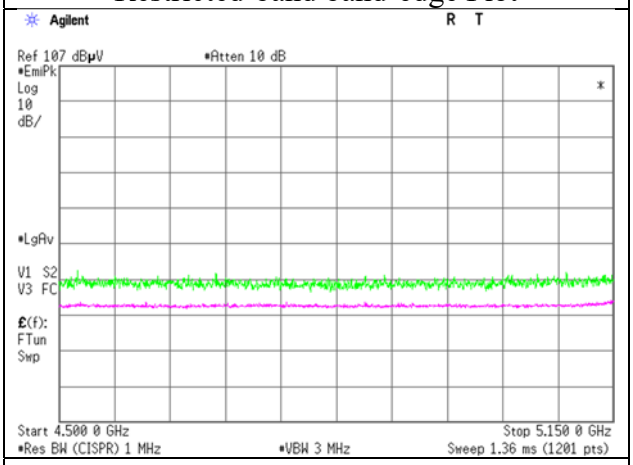
Restricted-band band-edge Plot



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

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)
Mode	Tx 11n-20 5320 MHz MIMO

(above 1GHz Inside of the restricted band)

(* 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.	5350.000	PK	51.82	31.98	16.27	43.21	2.28	59.14	73.9	14.7	115	170	
Hori.	5350.000	AV	40.16	31.98	16.27	43.21	2.28	47.48	53.9	**6.4**	115	170	VBW:5.1 kHz
Vert.	5350.000	PK	52.26	31.98	16.27	43.21	2.28	59.58	73.9	14.3	112	212	
Vert.	5350.000	AV	40.00	31.98	16.27	43.21	2.28	47.32	53.9	6.5	112	212	VBW:5.1 kHz

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

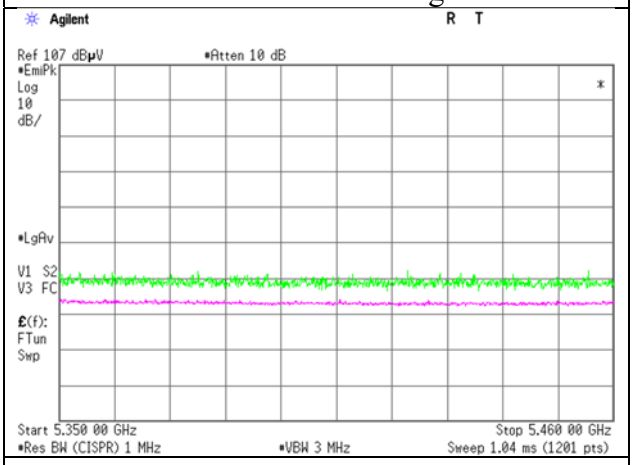
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-20 5320 MHz MIMO

Horizontal

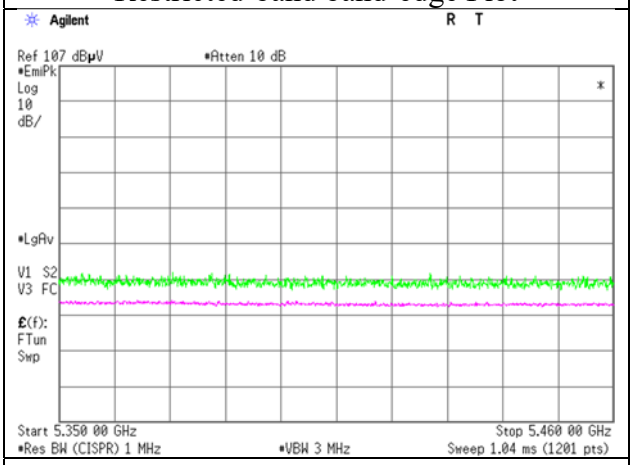
Restricted-band band-edge Plot



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

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3
Date	February 13, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	24 deg. C / 31 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada	Makoto Hosaka
	(1 GHz -6.4 GHz)	(6.4 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11n-40 5190 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	5150.000	PK	56.70	32.26	16.13	43.04	2.28	64.33	73.9	9.5	173	165	
Hori.	15570.000	PK	50.42	38.93	11.52	40.76	-9.54	50.57	73.9	23.3	148	345	
Hori.	5150.000	AV	45.27	32.26	16.13	43.04	2.28	52.90	53.9	**1.0**	173	165	VBW:5.1 kHz
Hori.	15570.000	AV	40.21	38.93	11.52	40.76	-9.54	40.36	53.9	13.5	148	345	VBW:5.1 kHz
Vert.	5150.000	PK	55.76	32.26	16.13	43.04	2.28	63.39	73.9	10.5	226	214	
Vert.	15570.000	PK	48.59	38.93	11.52	40.76	-9.54	48.74	73.9	25.1	174	211	
Vert.	5150.000	AV	44.32	32.26	16.13	43.04	2.28	51.95	53.9	1.9	226	214	VBW:5.1 kHz
Vert.	15570.000	AV	38.56	38.93	11.52	40.76	-9.54	38.71	53.9	15.1	174	211	VBW:5.1 kHz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	10380.000	PK	46.65	39.29	9.20	42.68	2.28	54.74	-40.48	-27.0	**13.4**	150	0	
Vert.	10380.000	PK	46.24	39.29	9.20	42.68	2.28	54.33	-40.89	-27.0	13.8	150	0	

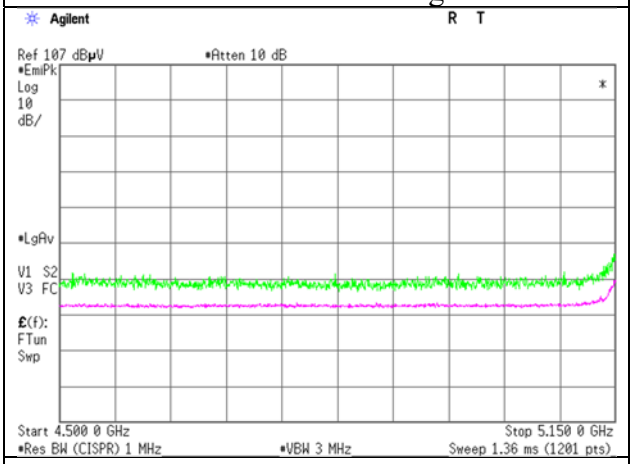
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Resrult(EIRP[dBm])=10*LOG（({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) *10^3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)
Mode	Tx 11n-40 5190 MHz SISO

Horizontal

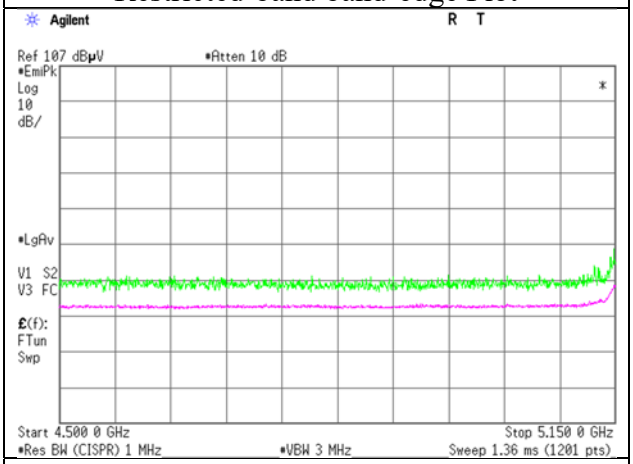
Restricted-band band-edge Plot



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

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3
Date	February 13, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	24 deg. C / 31 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada	Makoto Hosaka
	(1 GHz -6.4 GHz)	(6.4 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11n-40 5230 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	15690.000	PK	52.27	38.59	11.59	40.63	-9.54	52.28	73.9	21.6	151	126	
Hori.	15690.000	AV	42.61	38.59	11.59	40.63	-9.54	42.62	53.9	**11.2**	151	126	VBW:5.1 kHz
Vert.	15690.000	PK	52.01	38.59	11.59	40.63	-9.54	52.02	73.9	21.8	146	282	
Vert.	15690.000	AV	39.53	38.59	11.59	40.63	-9.54	39.54	53.9	14.3	146	282	VBW:5.1 kHz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	10460.000	PK	48.22	39.54	9.22	42.67	2.28	56.59	-38.63	-27.0	**11.6**	100	0	
Vert.	10460.000	PK	46.46	39.54	9.22	42.67	2.28	54.83	-40.39	-27.0	13.3	100	0	

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Resrult(EIRP[dBm])=10*LOG （({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) *10^3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3
Date	February 13, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	24 deg. C / 31 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada	Makoto Hosaka
	(1 GHz -6.4 GHz)	(6.4 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11n-40 5310 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	5350.000	PK	59.43	31.98	16.27	43.21	2.28	66.75	73.9	7.1	274	176	
Hori.	10620.000	PK	47.28	39.64	9.27	42.67	2.28	55.80	73.9	18.1	150	0	
Hori.	15930.000	PK	53.61	38.31	11.70	40.37	-9.54	53.71	73.9	20.1	146	134	
Hori.	5350.000	AV	43.98	31.98	16.27	43.21	2.28	51.30	53.9	2.6	274	176	VBW:5.1 kHz
Hori.	10620.000	AV	36.91	39.64	9.27	42.67	2.28	45.43	53.9	8.4	150	0	VBW:5.1 kHz
Hori.	15930.000	AV	43.69	38.31	11.70	40.37	-9.54	43.79	53.9	10.1	146	134	VBW:5.1 kHz
Vert.	5350.000	PK	60.99	31.98	16.27	43.21	2.28	68.31	73.9	5.5	117	217	
Vert.	10620.000	PK	46.46	39.64	9.27	42.67	2.28	54.98	73.9	18.9	150	0	
Vert.	15930.000	PK	51.81	38.31	11.70	40.37	-9.54	51.91	73.9	21.9	198	121	
Vert.	5350.000	AV	45.60	31.98	16.27	43.21	2.28	52.92	53.9	**0.9**	117	217	VBW:5.1 kHz
Vert.	10620.000	AV	37.10	39.64	9.27	42.67	2.28	45.62	53.9	8.2	150	0	VBW:5.1 kHz
Vert.	15930.000	AV	42.58	38.31	11.70	40.37	-9.54	42.68	53.9	11.2	198	121	VBW:5.1 kHz

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

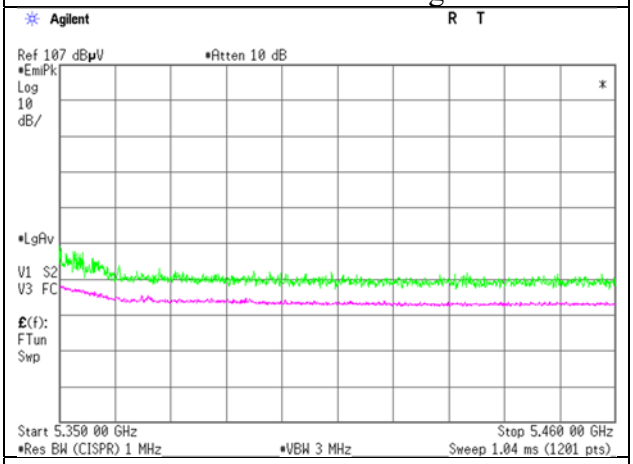
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-40 5310 MHz SISO

Horizontal

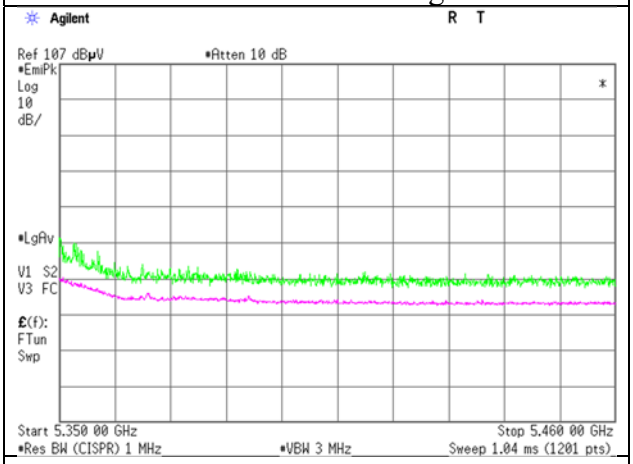
Restricted-band band-edge Plot



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

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka
	(1 GHz -6.4 GHz)
Mode	Tx 11n-40 5190 MHz MIMO

(above 1GHz Inside of the restricted band)

(* 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.	5150.000	PK	53.49	32.26	16.13	43.04	2.28	61.12	73.9	12.7	216	174	
Hori.	5150.000	AV	42.35	32.26	16.13	43.04	2.28	49.98	53.9	**3.9**	216	174	VBW:8.1 kHz
Vert.	5150.000	PK	52.59	32.26	16.13	43.04	2.28	60.22	73.9	13.6	216	124	
Vert.	5150.000	AV	41.73	32.26	16.13	43.04	2.28	49.36	53.9	4.5	216	124	VBW:8.1 kHz

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

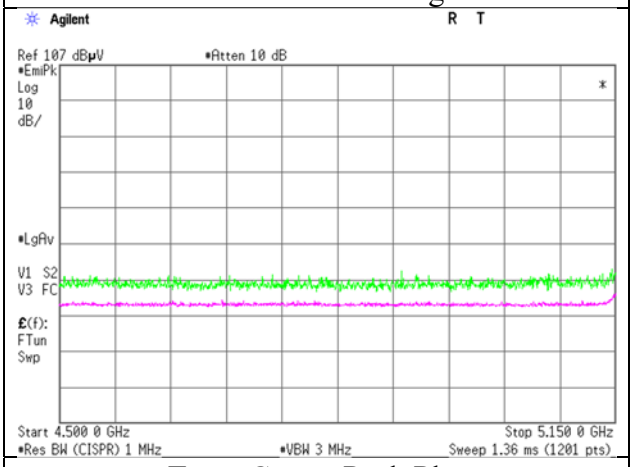
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-40 5190 MHz MIMO

Horizontal

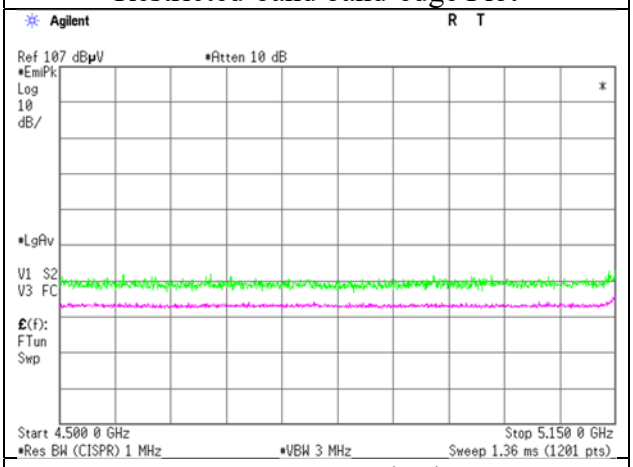
Restricted-band band-edge Plot



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

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka
	(1 GHz -6.4 GHz)
Mode	Tx 11n-40 5310 MHz MIMO

(above 1GHz Inside of the restricted band)

(* 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.	5350.000	PK	54.62	31.98	16.27	43.21	2.28	61.94	73.9	11.9	118	170	
Hori.	5350.000	AV	44.21	31.98	16.27	43.21	2.28	51.53	53.9	**2.3**	118	170	VBW:8.1 kHz
Vert.	5350.000	PK	55.27	31.98	16.27	43.21	2.28	62.59	73.9	11.3	112	216	
Vert.	5350.000	AV	44.12	31.98	16.27	43.21	2.28	51.44	53.9	2.4	112	216	VBW:8.1 kHz

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 4th harmonic was not seen so the result was its base noise level.

Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB

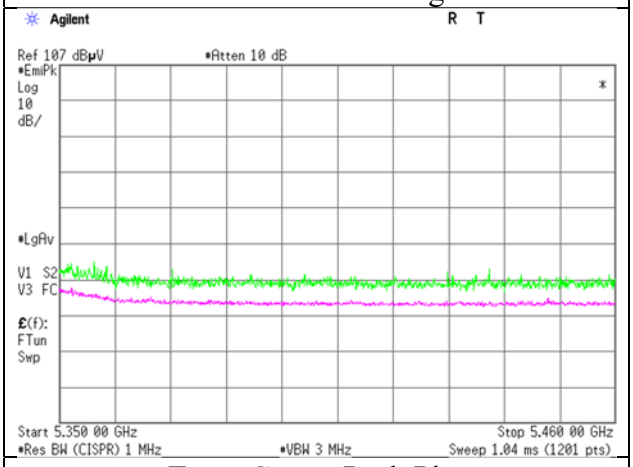
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-40 5310 MHz MIMO

Horizontal

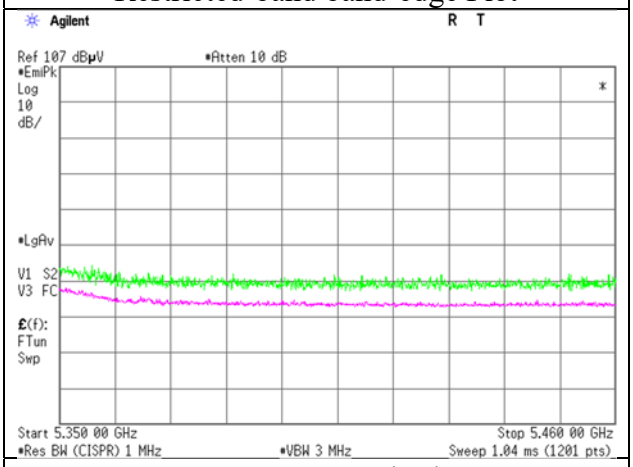
Restricted-band band-edge Plot



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

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3
Date	February 13, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	24 deg. C / 31 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)	Makoto Hosaka (6.4 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)	Makoto Hosaka (26.5 GHz -40 GHz)
Mode	Tx 11ac-80 5210 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	5150.000	PK	54.39	32.26	16.13	43.04	2.28	62.02	73.9	11.8	148	174	
Hori.	15630.000	PK	47.26	38.73	11.55	40.69	-9.54	47.31	73.9	26.5	147	136	
Hori.	5150.000	AV	44.59	32.26	16.13	43.04	2.28	52.22	53.9	1.6	148	174	VBW:9.1 kHz
Hori.	15630.000	AV	39.06	38.73	11.55	40.69	-9.54	39.11	53.9	14.7	147	136	VBW:9.1 kHz
Vert.	5150.000	PK	54.72	32.26	16.13	43.04	2.28	62.35	73.9	11.5	183	229	
Vert.	15630.000	PK	47.51	38.73	11.55	40.69	-9.54	47.56	73.9	26.3	150	0	
Vert.	5150.000	AV	45.08	32.26	16.13	43.04	2.28	52.71	53.9	**1.1**	183	229	VBW:9.1 kHz
Vert.	15630.000	AV	38.63	38.73	11.55	40.69	-9.54	38.68	53.9	15.2	150	0	VBW:9.1 kHz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	10420.000	PK	47.11	39.45	9.21	42.68	2.28	55.37	-39.85	-27.0	12.8	150	0	
Vert.	10420.000	PK	48.00	39.45	9.21	42.68	2.28	56.26	-38.96	-27.0	**11.9**	150	0	

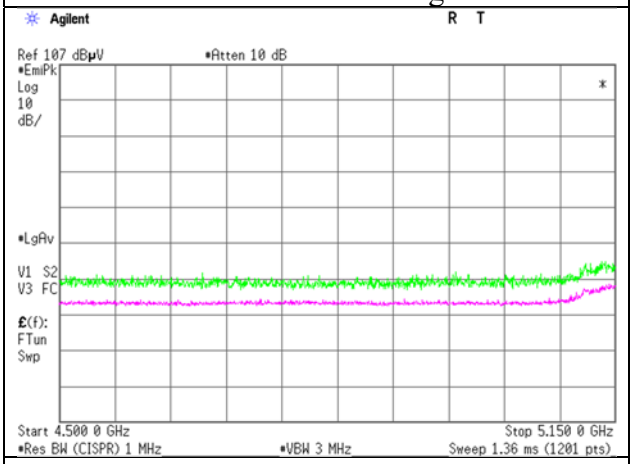
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Resrult(EIRP[dBm])=10*LOG（({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) *10^3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)
Mode	Tx 11ac-80 5210 MHz SISO

Horizontal

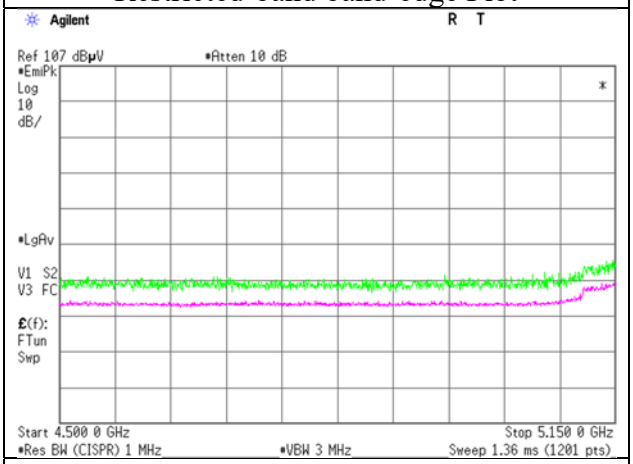
Restricted-band band-edge Plot



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

Report No.	13211388S-H				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3
Date	February 13, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	24 deg. C / 31 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada	Makoto Hosaka
	(1 GHz -6.4 GHz)	(6.4 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11ac-80 5290 MHz SISO				

(above 1GHz Inside of the restricted band)

(* 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.	5350.000	PK	52.36	31.98	16.27	43.21	2.28	59.68	73.9	14.2	143	177	
Hori.	15870.000	PK	46.92	38.31	11.67	40.44	-9.54	46.92	73.9	26.9	146	130	
Hori.	5350.000	AV	42.05	31.98	16.27	43.21	2.28	49.37	53.9	4.5	143	177	VBW:9.1 kHz
Hori.	15870.000	AV	38.42	38.31	11.67	40.44	-9.54	38.42	53.9	15.4	146	130	VBW:9.1 kHz
Vert.	5350.000	PK	52.29	31.98	16.27	43.21	2.28	59.61	73.9	14.2	110	214	
Vert.	15870.000	PK	47.17	38.31	11.67	40.44	-9.54	47.17	73.9	26.7	150	0	
Vert.	5350.000	AV	42.57	31.98	16.27	43.21	2.28	49.89	53.9	**4.0**	110	214	VBW:9.1 kHz
Vert.	15870.000	AV	37.08	38.31	11.67	40.44	-9.54	37.08	53.9	16.8	150	0	VBW:9.1 kHz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	10580.000	PK	46.61	39.65	9.26	42.67	2.28	55.13	-40.09	-27.0	13.0	150	0	
Vert.	10580.000	PK	48.34	39.65	9.26	42.67	2.28	56.86	-38.36	-27.0	**11.3**	150	0	

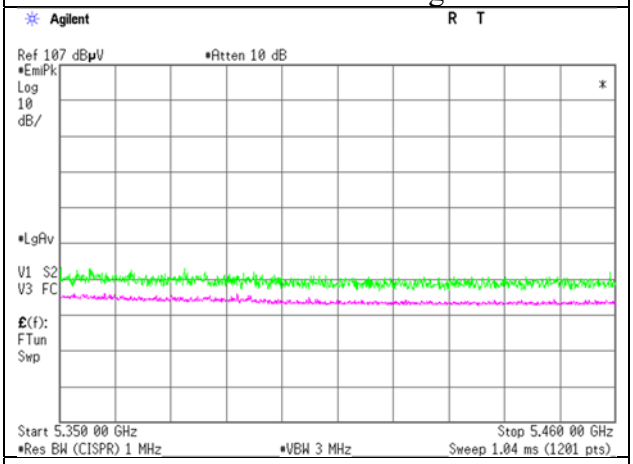
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Resrult(EIRP[dBm])=10*LOG （({ 10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance:3[m]) ^ 2 } / 30) *10^3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka
Mode	Tx 11ac-80 5290 MHz SISO

Horizontal

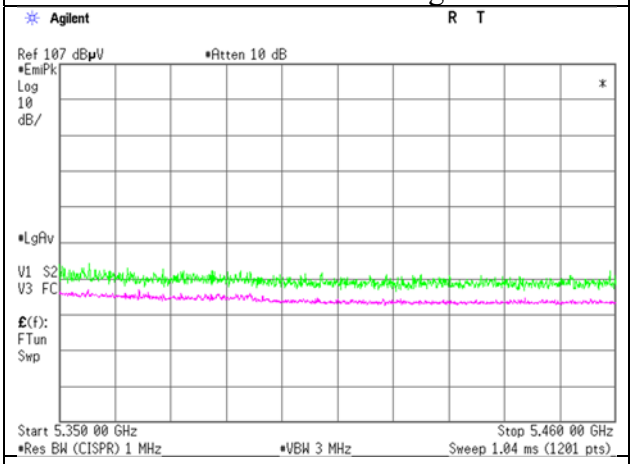
Restricted-band band-edge Plot



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

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 8, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka
	(1 GHz -6.4 GHz)
Mode	Tx 11ac-80 5210 MHz MIMO

(above 1GHz Inside of the restricted band)

(* 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.	5150.000	PK	47.19	32.69	16.07	38.63	2.28	59.60	73.9	14.3	138	169	
Hori.	5150.000	AV	37.57	32.69	16.07	38.63	2.28	49.98	53.9	**3.9**	138	169	VBW:12 kHz
Vert.	5150.000	PK	46.89	32.69	16.07	38.63	2.28	59.30	73.9	14.6	269	225	
Vert.	5150.000	AV	37.38	32.69	16.07	38.63	2.28	49.79	53.9	4.1	269	225	VBW:12 kHz

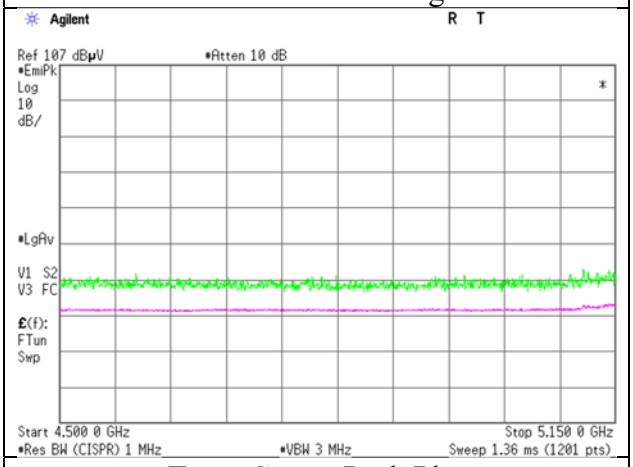
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 8, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Makoto Hosaka
Mode	Tx 11ac-80 5210 MHz MIMO

Horizontal

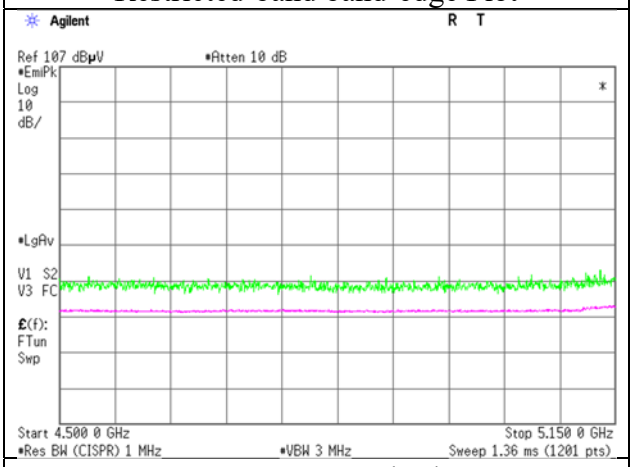
Restricted-band band-edge Plot



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

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka (1 GHz -6.4 GHz)
Mode	Tx 11ac-80 5290 MHz MIMO

(above 1GHz Inside of the restricted band)

(* 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.	5350.000	PK	51.25	31.98	16.27	43.21	2.28	58.57	73.9	15.3	148	172	
Hori.	5350.000	AV	41.65	31.98	16.27	43.21	2.28	48.97	53.9	**4.9**	148	172	VBW:12 kHz
Vert.	5350.000	PK	50.93	31.98	16.27	43.21	2.28	58.25	73.9	15.6	250	232	
Vert.	5350.000	AV	41.20	31.98	16.27	43.21	2.28	48.52	53.9	5.3	250	232	VBW:12 kHz

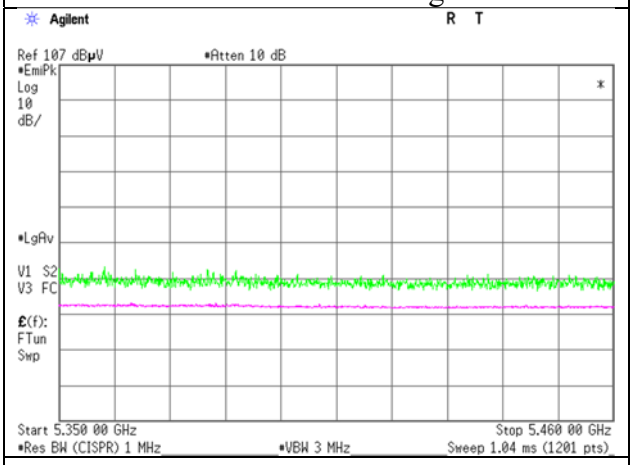
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).
*The 4th harmonic was not seen so the result was its base noise level.
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13211388S-H
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 13, 2020
Temperature / Humidity	24 deg. C / 31 % RH
Engineer	Makoto Hosaka
Mode	Tx 11ac-80 5290 MHz MIMO

Horizontal

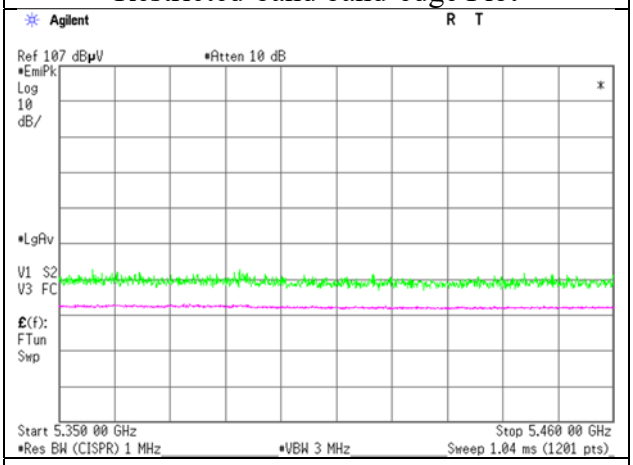
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot

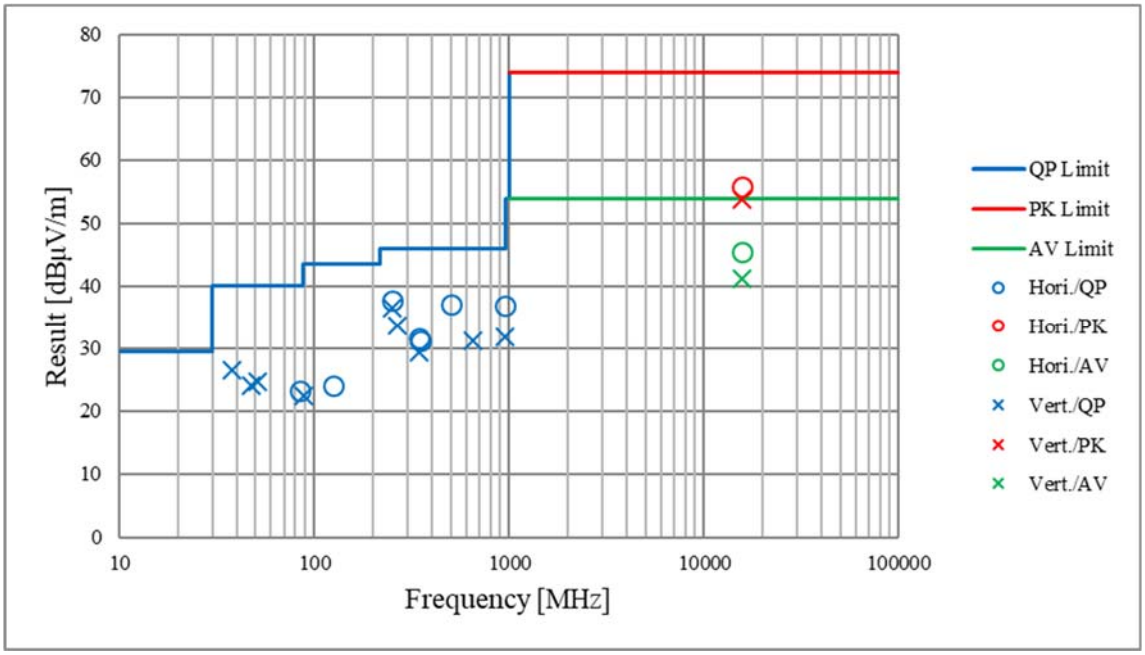


Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13211388S-H					
Test place	Shonan EMC Lab.					
Semi Anechoic Chamber	No.3	No.3	No.3	No.3	No.3	No.3
Date	February 27, 2020	February 12, 2020	February 13, 2020	February 13, 2020	February 25, 2020	February 14, 2020
Temperature / Humidity	23 deg. C / 37 % RH	22 deg. C / 35 % RH	24 deg. C / 31 % RH	24 deg. C / 31 % RH	23 deg. C / 45 % RH	22 deg. C / 40 % RH
Engineer	Toshinori Yamada	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada	Makoto Hosaka
	(30 MHz - 1000 MHz)	(1 GHz -6.4 GHz)	(6.4 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11ac-20 5260 MHz SISO					



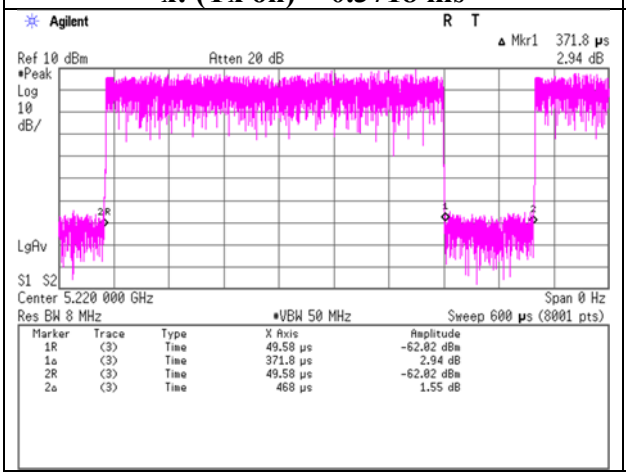
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Burst rate confirmation

Report No.	13211388S-H
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	February 4, 2020
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Makoto Hosaka
Mode	Tx

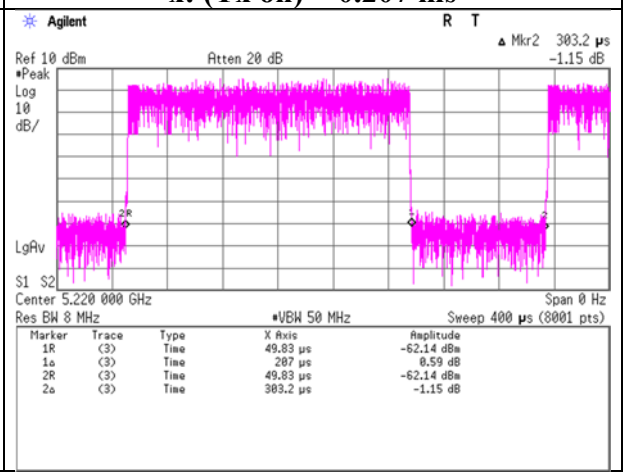
11ac-20, SISO, MCS 3

VBW: 1/x = 2700 Hz (2690 Hz)
x: (Tx on) = 0.3718 ms



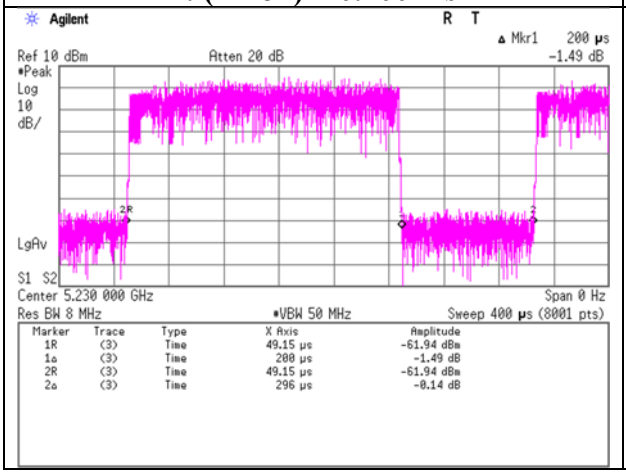
11n-20, MIMO MCS 11

VBW: 1/x = 5100 Hz (4831 Hz)
x: (Tx on) = 0.207 ms



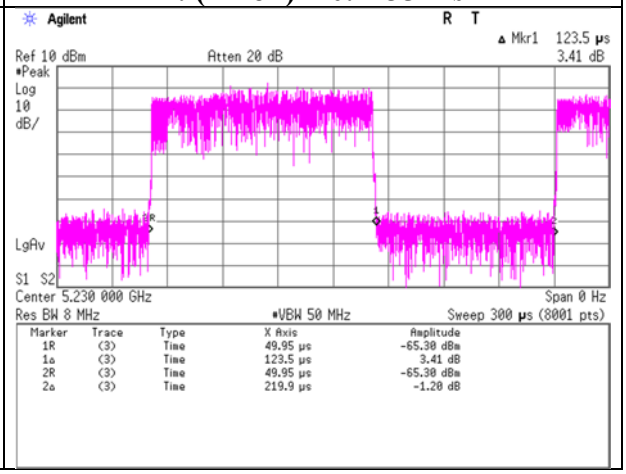
11n-40, SISO, MCS 3

VBW: 1/x = 5100 Hz (5000 Hz)
x: (Tx on) = 0.200 ms



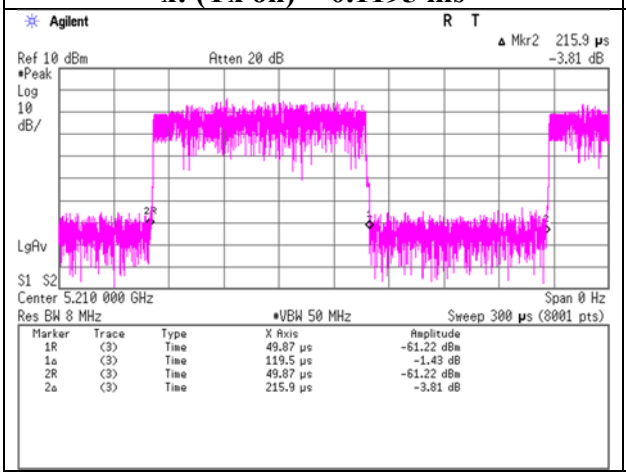
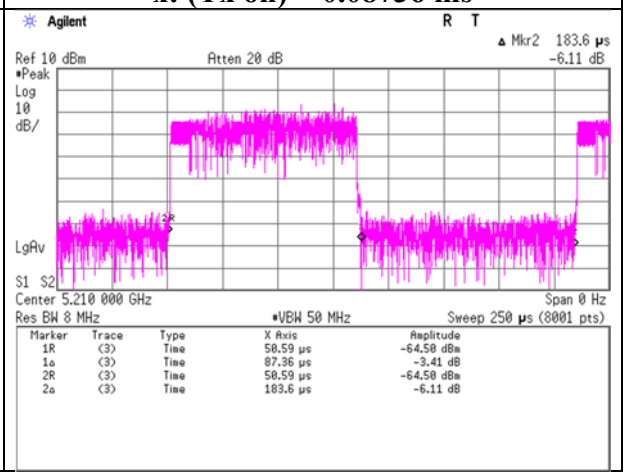
11n-40, MIMO MCS 11

VBW: 1/x = 8100 Hz (8097 Hz)
x: (Tx on) = 0.1235 ms



Burst rate confirmation

Report No.	13211388S-H
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	February 4, 2020
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Makoto Hosaka
Mode	Tx

11ac-80, SISO, MCS 3	11ac-80, MIMO, MCS 3
VBW: 1/x = 9100 Hz (8368 Hz) x: (Tx on) = 0.1195 ms	VBW: 1/x = 12000 Hz (11447 Hz) x: (Tx on) = 0.08736 ms
	

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	COTS-SEMI-5	170932	EMI Software	TSJ	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	2019/11/05	12
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2019/05/09	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2019/04/08	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2019/05/03	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2020/02/19	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2019/07/12	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2020/02/20	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2019/03/05	12
RE	SAF-10	145129	Pre Amplifier	Toyo Corporation	HAP26-40W	10	2019/03/22	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2019/11/06	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2020/02/21	12
RE	SBA-03	145023	Biconical Antenna	Schwarzbeck	BBA9106	91032666	2019/05/07	12
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2019/04/19	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2019/03/27	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2020/01/08	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2020/01/08	12
RE	SCC-G43	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	SN MY 13406/4E	2019/07/03	12
RE	SCC-G45	168301	Coaxial Cable	HUBER+SUNER	SUCOFLEX 102 E	800137/2EA	2019/03/26	12
RE	SCC-G50	178573	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	MY13407/4E	2019/03/26	12
RE	SCC-G51	178572	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800288 /4A	2019/03/26	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2019/05/16	12
RE	SCC-G58	183047	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800287/4A	2019/07/23	12
RE	SFL-03	145377	Highpass Filter	MICRO-TRONICS	HPM50112	28	2019/11/06	12
RE	SFL-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2019/04/16	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	2019/06/26	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	2019/06/26	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2019/06/26	12
RE	SHA-06	145514	Horn Antenna	ETS LINDGREN	3160-10	00092383	2019/06/26	12
RE	SJM-09	145336	Measure	PROMART	SEN1935	-	-	-
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	2019/05/07	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2019/09/13	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
RE	STS-02	145793	Digital Hitester	HIOKI	3805-50	80997819	2019/04/02	12
RE	STS-03	146210	Digital Hitester	HIOKI	3805-50	80997823	2019/10/01	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