RADIO TEST REPORT

Test Report No. : 13211388S-D

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 C: 2020** **For Permissive Change** **(Radiated Spurious Emission tests only)** *Wireless LAN 2.4 GHz band and Bluetooth low energy 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.
   It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.

Date of test: February 4 to 27, 2020

Representative test engineer:
Y. Tanikawara
Yusuke Tanikawara
Engineer
Consumer Technology Division

Approved by:
A. Hayashi
Akio Hayashi
Leader
Consumer Technology Division

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".

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

REVISION HISTORY

Original Test Report No.: 13211388S-D

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13211388S-D	June 22, 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 C
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 C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

* The 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 & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	2.8 dB 2385.200 MHz, AV, Vertical Mode: Tx 11n-40 2422 MHz MIMO	Complied# a)	Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6. a) Refer to APPENDIX 1 (data of Radiated Spurious Emission)					
Symbols: Complied — The data of this test item has enough margin, more than the measurement uncertainty. Complied# — The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

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

FCC Part 15.31 (e)
This EUT provides 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 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	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
(Measurement distance: 3 m)	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	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
(Measurement distance: 1 m)	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

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
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, OFDM VHT 20, MIMO	2437 MHz	MCS 3, PN9	0 & 1
	Transmitting, Bluetooth Low energy	2402 MHz, 2440 MHz, 2480 MHz	PRBS9	0
Radiated emission (above 1 GHz) *3)	Transmitting, IEEE 802.11b	2412 MHz, 2437 MHz, 2462 MHz, 2467 MHz, 2472 MHz *5)	11 Mbps, PN9	0
	Transmitting, OFDM VHT 20, MIMO	2412 MHz, 2437 MHz, 2462 MHz, 2467 MHz, 2472 MHz *5)	MCS 3, PN9	0 & 1
	Transmitting, IEEE 802.11n-20, SISO *4)	2412 MHz, 2462 MHz, 2467 MHz, 2472 MHz *5)	MCS 3, PN9	1
	Transmitting, IEEE 802.11n-40, MIMO	2422 MHz, 2437 MHz, 2457 MHz, 2462 MHz *6)	MCS 11, PN9	0 & 1
	Transmitting, IEEE 802.11n-40, SISO *4)	2422 MHz, 2462 MHz	MCS 3, PN9	0
	Transmitting, Bluetooth Low energy	2402 MHz, 2440 MHz, 2480 MHz	PRBS9	0

*Power of the EUT was set by the software as follows;
Power settings: Wireless LAN: Fixed (refer to power setting table)
Bluetooth low energy: Fixed
Software: Wireless LAN: cmd.exe, Ver. 6.3.960017415,
Bluetooth low energy: Bluetool.exe, Ver.1.9.3.0
(Date: 2020.2.4, Storage location: Driven by connected PC)

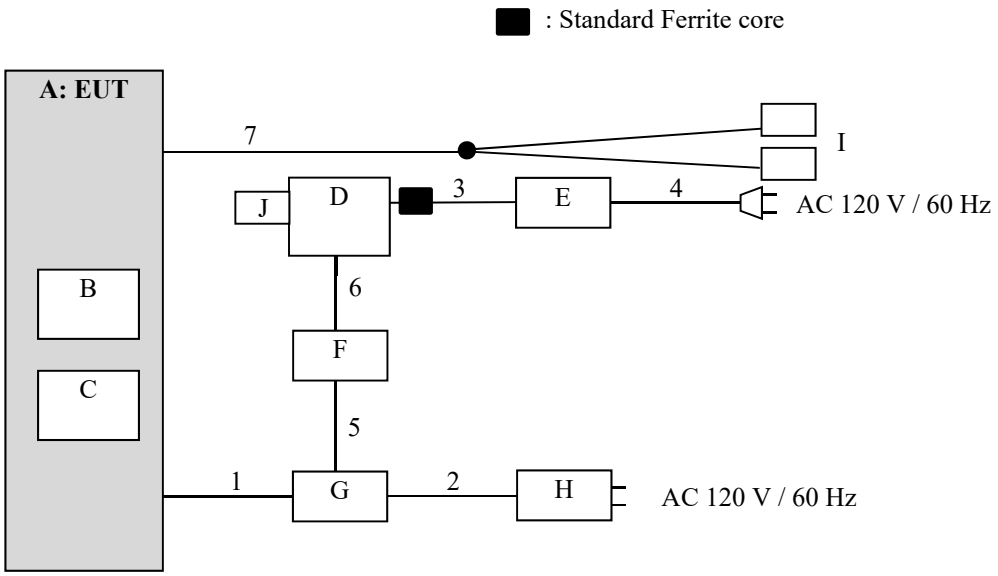
*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.

*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 11g, 11n-20 and 11ac-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.
*4) This mode wasn't worst, but only band edge of spurious emissions were measured for confirmation.
*5) The channel on 2462 MHz and 2467 MHz were measured, since the power setting of the channel on 2462 MHz and 2467 MHz were higher than the channel on 2472 MHz.
*6) The channel on 2457 MHz were measured, since the power setting of the channel on 2457 MHz were higher than the channel on 2462 MHz.

Power setting (target power) table of Wireless LAN:

Bandwidth	Channel frequency	Mode	Rate / MCS mode [dBm]									
20 MHz	2412 MHz – 2462 MHz	11b	1 M	2 M	5.5 M	11 M	-	-	-	-	-	-
			17.5	17.5	17.5	17.5	-	-	-	-	-	-
	2467 MHz		1 M	2 M	5.5 M	11 M	-	-	-	-	-	-
			8.5	8.5	8.5	8.5	-	-	-	-	-	-
	2472 MHz		1 M	2 M	5.5 M	11 M	-	-	-	-	-	-
			3.5	3.5	3.5	3.5	-	-	-	-	-	-
	2412 MHz – 2462 MHz	11g	6 M	9 M	12 M	18 M	24 M	36 M	48 M	54 M	-	-
			16.5	16.5	16.5	16.5	14.5	14.5	14.5	14.5	-	-
	2467 MHz		6 M	9 M	12 M	18 M	24 M	36 M	48 M	54 M	-	-
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	-	-
	2472 MHz		6 M	9 M	12 M	18 M	24 M	36 M	48 M	54 M	-	-
			3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	-	-
	2412 MHz – 2462 MHz	11n-20 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			16.5	16.5	16.5	16.5	15.5	15.5	15.5	14.5	-	-
	2467 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	-	-
	2472 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	-	-
	2412 MHz – 2462 MHz	11n-20 (MIMO)	MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	-	-
	2467 MHz		MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	-	-
	2472 MHz		MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-	-
	2412 MHz – 2462 MHz	OFDM VHT20 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			16.5	16.5	16.5	16.5	15.5	15.5	15.5	14.5	13.0	-
	2467 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	-
	2472 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	-
	2412 MHz – 2462 MHz	OFDM VHT20 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	-
	2467 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	-
	2472 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	-
			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-
40 MHz	2422 MHz – 2452 MHz	11n-40 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	-	-
	2457 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	-	-
	2462 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	-	-
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	-	-
	2422 MHz – 2452 MHz	11n-40 (MIMO)	MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	-	-
	2457 MHz		MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	-	-
	2462 MHz		MCS 8	MCS 9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	-	-
			5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	-	-
	2422 MHz – 2452 MHz	OFDM VHT40 (SISO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	2457 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	2462 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	2422 MHz – 2452 MHz	OFDM VHT40 (MIMO)	MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
	2457 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
	2462 MHz		MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
			5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5

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

Test Procedure

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

[For below 1 GHz]
EUT was placed on a platform of nominal size, 1.0 m by 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.

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

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

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

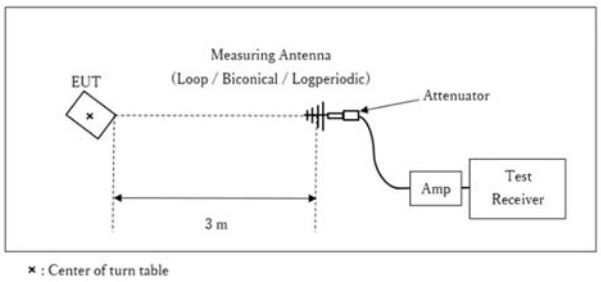
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	[WLAN part] *1) 11.12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz
			[BT LE part] *2)	

*1) Average Power Measurement was performed based on ANSI C63.10-2013.
*2) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector used Duty cycle correction factor (DCCF).

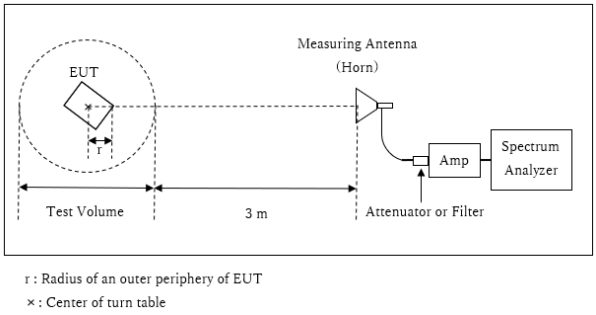
Figure 1: Test Setup

Below 1 GHz



Test Distance: 3 m

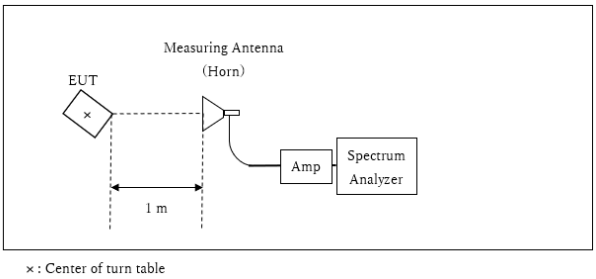
1 GHz - 13 GHz



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 - 26.5 GHz



Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB
*Test Distance: 1 m

The 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.

Combinations of the worst case

Wireless LAN

	Frequency / Antenna polarization	Carrier	Spurious			
			Below 1 GHz	1 GHz – 2.8 GHz	2.8 GHz – 13 GHz	13 GHz – 26.5 GHz
SISO	Horizontal	Z	-	Z	Z	X
	Vertical	Y	-	Y	Y	X
MIMO	Horizontal	X	Y	Z	X	X
	Vertical	Y	Y	Y	Y	X

Bluetooth Low Energy

Frequency / Antenna polarization	Carrier	Spurious			
		Below 1 GHz	1 GHz - 2.8 GHz	2.8 GHz - 13 GHz	13-26.5 GHz
Horizontal	X	X	X	X	X
Vertical	Y	X	Y	Y	X

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

APPENDIX 1: Test data

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 10, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	23 deg. C / 32 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)	Makoto Hosaka (2.8 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)
Mode	Tx 11b 2412 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	51.68	28.33	14.08	41.59	2.28	54.78	73.9	19.1	141	132	
Hori.	4824.000	PK	48.60	31.71	6.35	38.55	2.28	50.39	73.9	23.5	150	217	
Hori.	7236.000	PK	47.04	37.32	7.80	39.20	2.28	55.24	73.9	18.6	127	212	
Hori.	9648.000	PK	45.24	38.93	9.01	39.71	2.28	55.75	73.9	**18.1**	150	0	
Hori.	14472.000	PK	46.96	41.37	11.14	41.45	-9.54	48.48	73.9	25.4	150	0	
Vert.	2390.000	PK	50.65	28.33	14.08	41.59	2.28	53.75	73.9	20.1	275	122	
Vert.	4824.000	PK	48.07	31.71	6.35	38.55	2.28	49.86	73.9	24.0	283	158	
Vert.	7236.000	PK	45.98	37.32	7.80	39.20	2.28	54.18	73.9	19.7	356	222	
Vert.	9648.000	PK	44.98	38.93	9.01	39.71	2.28	55.49	73.9	18.4	150	0	
Vert.	14472.000	PK	47.66	41.37	11.14	41.45	-9.54	49.18	73.9	24.7	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	41.08	28.33	14.08	41.59	0.86	2.28	45.04	53.9	8.8	*1)
Hori.	4824.000	AV	38.24	31.71	6.35	38.55	0.86	2.28	40.89	53.9	13.0	
Hori.	7236.000	AV	37.01	37.32	7.80	39.20	0.86	2.28	46.07	53.9	7.8	
Hori.	9648.000	AV	35.41	38.93	9.01	39.71	0.86	2.28	46.78	53.9	**7.1**	
Hori.	14472.000	AV	37.66	41.37	11.14	41.45	0.86	-9.54	40.04	53.9	13.8	
Vert.	2390.000	AV	40.56	28.33	14.08	41.59	0.86	2.28	44.52	53.9	9.3	*1)
Vert.	4824.000	AV	37.88	31.71	6.35	38.55	0.86	2.28	40.53	53.9	13.3	
Vert.	7236.000	AV	35.90	37.32	7.80	39.20	0.86	2.28	44.96	53.9	8.9	
Vert.	9648.000	AV	34.59	38.93	9.01	39.71	0.86	2.28	45.96	53.9	7.9	
Vert.	14472.000	AV	37.82	41.37	11.14	41.45	0.86	-9.54	40.20	53.9	13.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

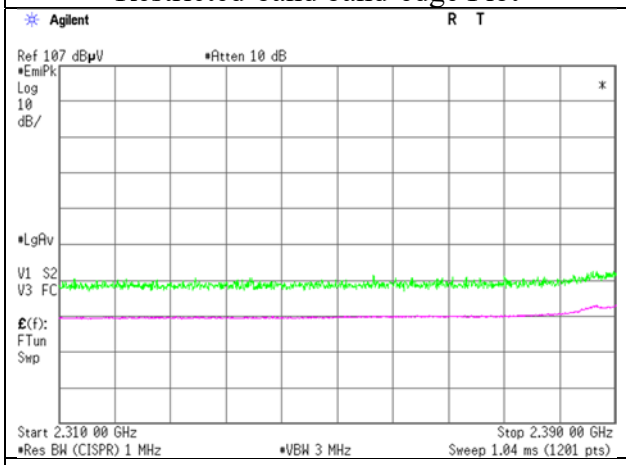
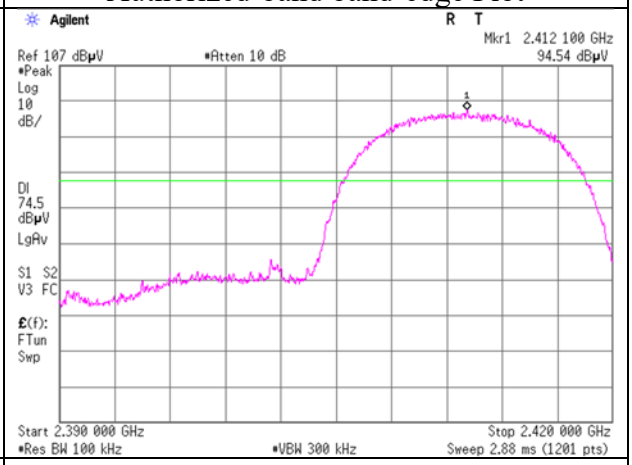
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

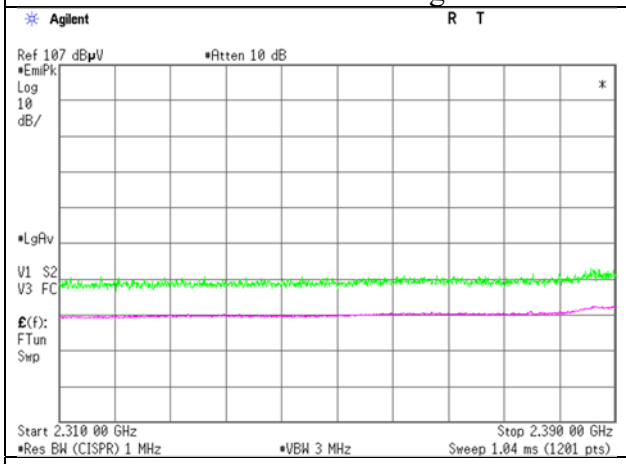
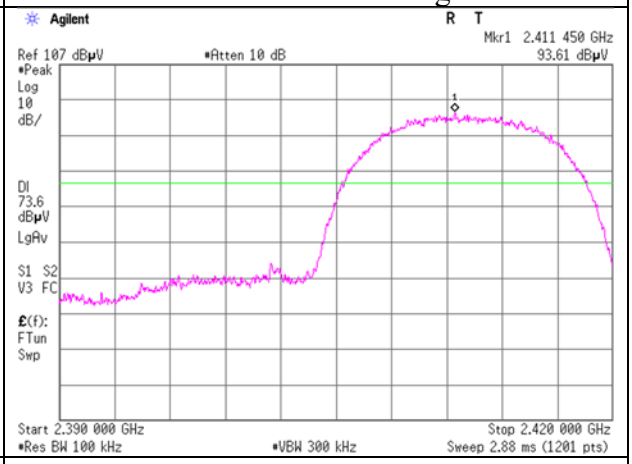
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	93.72	28.29	14.09	41.60	2.28	96.78	-	-	Carrier
Hori.	2399.456	PK	48.61	28.31	14.08	41.60	2.28	51.68	76.78	25.1	
Hori.	2400.000	PK	47.56	28.31	14.08	41.60	2.28	50.63	76.78	26.1	
Vert.	2412.000	PK	93.57	28.29	14.09	41.60	2.28	96.63	-	-	Carrier
Vert.	2399.425	PK	47.58	28.31	14.08	41.60	2.28	50.65	76.63	25.9	
Vert.	2400.000	PK	46.10	28.31	14.08	41.60	2.28	49.17	76.63	27.4	

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

Report No.	13211388S-D
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 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka (1 GHz -2.8 GHz)	Makoto Hosaka (2.8 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)
Mode	Tx 11b 2437 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	50.32	31.73	6.39	38.55	2.28	52.17	73.9	21.7	255	215	
Hori.	7311.000	PK	47.60	37.40	7.86	39.31	2.28	55.83	73.9	18.0	177	221	
Hori.	9748.000	PK	45.06	39.32	9.05	39.64	2.28	56.07	73.9	17.8	252	215	
Hori.	14622.000	PK	47.17	41.44	11.21	41.23	-9.54	49.05	73.9	24.8	150	0	
Vert.	4874.000	PK	50.07	31.73	6.39	38.55	2.28	51.92	73.9	21.9	155	162	
Vert.	7311.000	PK	46.39	37.40	7.86	39.31	2.28	54.62	73.9	19.2	381	231	
Vert.	9748.000	PK	45.14	39.32	9.05	39.64	2.28	56.15	73.9	**17.7**	150	0	
Vert.	14622.000	PK	47.92	41.44	11.21	41.23	-9.54	49.80	73.9	24.1	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	39.39	31.73	6.39	38.55	0.86	2.28	42.10	53.9	11.8	
Hori.	7311.000	AV	36.42	37.40	7.86	39.31	0.86	2.28	45.51	53.9	8.3	
Hori.	9748.000	AV	34.87	39.32	9.05	39.64	0.86	2.28	46.74	53.9	**7.1**	
Hori.	14622.000	AV	37.47	41.44	11.21	41.23	0.86	-9.54	40.21	53.9	13.6	
Vert.	4874.000	AV	39.20	31.73	6.39	38.55	0.86	2.28	41.91	53.9	11.9	
Vert.	7311.000	AV	36.17	37.40	7.86	39.31	0.86	2.28	45.26	53.9	8.6	
Vert.	9748.000	AV	34.85	39.32	9.05	39.64	0.86	2.28	46.72	53.9	**7.1**	
Vert.	14622.000	AV	37.41	41.44	11.21	41.23	0.86	-9.54	40.15	53.9	13.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)	Makoto Hosaka (2.8 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)
Mode	Tx 11b 2462 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	52.05	28.24	14.17	41.62	2.28	55.12	73.90	18.7	122	45	
Hori.	4924.000	PK	50.09	31.85	6.41	38.55	2.28	52.08	73.90	21.8	250	217	
Hori.	7386.000	PK	46.29	37.51	7.91	39.43	2.28	54.56	73.90	19.3	264	214	
Hori.	9848.000	PK	46.38	39.50	9.09	39.56	2.28	57.69	73.90	**16.2**	132	218	
Hori.	14772.000	PK	47.35	41.15	11.30	41.02	-9.54	49.24	73.90	24.6	150	0	
Vert.	2483.500	PK	51.97	28.24	14.17	41.62	2.28	55.04	73.90	18.8	236	130	
Vert.	4924.000	PK	50.01	31.85	6.41	38.55	2.28	52.00	73.90	21.9	340	172	
Vert.	7386.000	PK	45.68	37.51	7.91	39.43	2.28	53.95	73.90	19.9	150	0	
Vert.	9848.000	PK	45.49	39.50	9.09	39.56	2.28	56.80	73.90	17.1	150	0	
Vert.	14772.000	PK	48.16	41.15	11.30	41.02	-9.54	50.05	73.90	23.8	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	41.02	28.24	14.17	41.62	0.86	2.28	44.95	53.9	8.9	*1)
Hori.	4924.000	AV	39.15	31.85	6.41	38.55	0.86	2.28	42.00	53.9	11.9	
Hori.	7386.000	AV	36.61	37.51	7.91	39.43	0.86	2.28	45.74	53.9	8.1	
Hori.	9848.000	AV	36.89	39.50	9.09	39.56	0.86	2.28	49.06	53.9	**4.8**	
Hori.	14772.000	AV	37.47	41.15	11.30	41.02	0.86	-9.54	40.22	53.9	13.6	
Vert.	2483.500	AV	40.77	28.24	14.17	41.62	0.86	2.28	44.70	53.9	9.2	*1)
Vert.	4924.000	AV	39.04	31.85	6.41	38.55	0.86	2.28	41.89	53.9	12.0	
Vert.	7386.000	AV	35.65	37.51	7.91	39.43	0.86	2.28	44.78	53.9	9.1	
Vert.	9848.000	AV	35.64	39.50	9.09	39.56	0.86	2.28	47.81	53.9	6.0	
Vert.	14772.000	AV	37.35	41.15	11.30	41.02	0.86	-9.54	40.10	53.9	13.8	

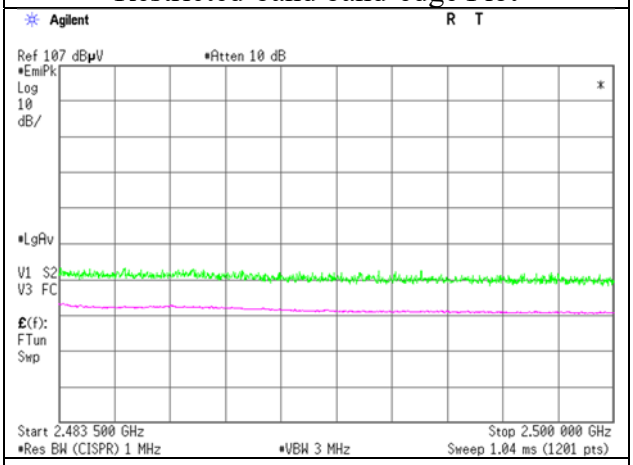
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada
Mode	Tx 11b 2462 MHz

Horizontal

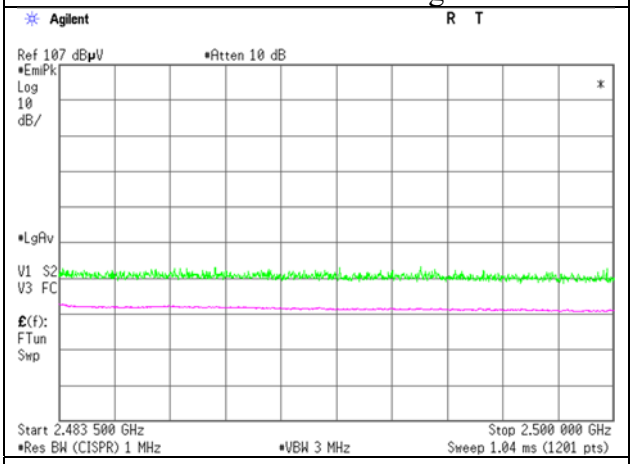
Restricted-band band-edge Plot



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

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)	Makoto Hosaka (2.8 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)
Mode	Tx 11b 2467 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.91	28.24	14.17	41.62	2.28	52.98	73.9	20.9	221	41	
Hori.	4934.000	PK	45.94	31.89	6.42	38.55	2.28	47.98	73.9	25.9	147	153	
Hori.	7401.000	PK	45.65	37.54	7.93	39.45	2.28	53.95	73.9	19.9	151	167	
Hori.	9868.000	PK	45.51	39.51	9.10	39.55	2.28	56.85	73.9	**17.0**	100	0	
Hori.	14802.000	PK	47.58	41.04	11.32	40.98	-9.54	49.42	73.9	24.4	150	0	
Vert.	2483.500	PK	50.34	28.24	14.17	41.62	2.28	53.41	73.9	20.4	232	131	
Vert.	4934.000	PK	45.62	31.89	6.42	38.55	2.28	47.66	73.9	26.2	136	166	
Vert.	7401.000	PK	45.43	37.54	7.93	39.45	2.28	53.73	73.9	20.1	150	0	
Vert.	9868.000	PK	45.41	39.51	9.10	39.55	2.28	56.75	73.9	17.1	150	0	
Vert.	14802.000	PK	47.01	41.04	11.32	40.98	-9.54	48.85	73.9	25.0	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.58	28.24	14.17	41.62	0.86	2.28	42.51	53.9	11.3	*1)
Hori.	4934.000	AV	36.31	31.89	6.42	38.55	0.86	2.28	39.21	53.9	14.6	
Hori.	7401.000	AV	35.59	37.54	7.93	39.45	0.86	2.28	44.75	53.9	9.1	
Hori.	9868.000	AV	35.86	39.51	9.10	39.55	0.86	2.28	48.06	53.9	5.8	
Hori.	14802.000	AV	37.49	41.04	11.32	40.98	0.86	-9.54	40.19	53.9	13.7	
Vert.	2483.500	AV	39.81	28.24	14.17	41.62	0.86	2.28	43.74	53.9	10.1	*1)
Vert.	4934.000	AV	35.85	31.89	6.42	38.55	0.86	2.28	38.75	53.9	15.1	
Vert.	7401.000	AV	35.45	37.54	7.93	39.45	0.86	2.28	44.61	53.9	9.2	
Vert.	9868.000	AV	36.05	39.51	9.10	39.55	0.86	2.28	48.25	53.9	**5.6**	
Vert.	14802.000	AV	37.42	41.04	11.32	40.98	0.86	-9.54	40.12	53.9	13.7	

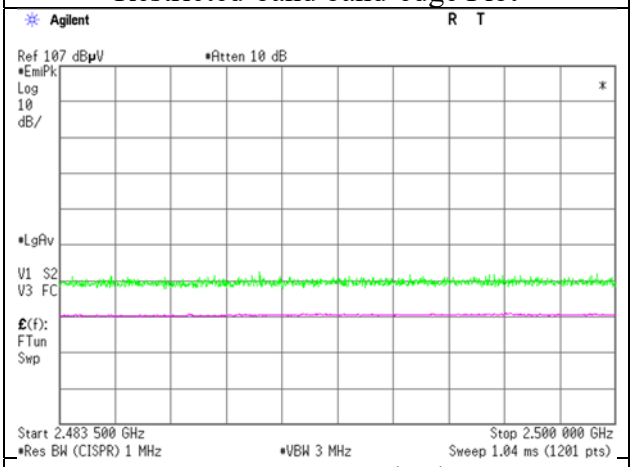
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada
Mode	Tx 11b 2467 MHz

Horizontal

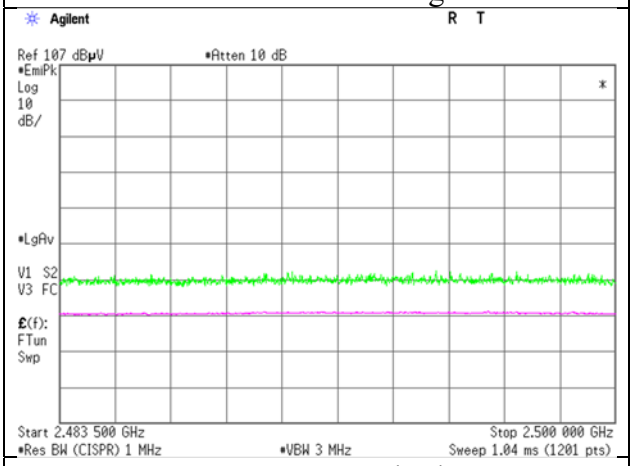
Restricted-band band-edge Plot



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

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)	Makoto Hosaka (2.8 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)
Mode	Tx 11b 2472 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.32	28.24	14.17	41.62	2.28	52.39	73.9	21.5	161	47	
Hori.	4944.000	PK	46.20	31.93	6.42	38.55	2.28	48.28	73.9	25.6	135	159	
Hori.	7416.000	PK	45.21	37.57	7.93	39.47	2.28	53.52	73.9	20.3	150	0	
Hori.	9888.000	PK	45.94	39.50	9.13	39.53	2.28	57.32	73.9	16.5	150	0	
Hori.	14832.000	PK	47.26	40.92	11.33	40.93	-9.54	49.04	73.9	24.8	150	0	
Vert.	2483.500	PK	50.59	28.24	14.17	41.62	2.28	53.66	73.9	20.2	107	269	
Vert.	2492.836	PK	51.54	28.23	14.17	41.63	2.28	54.59	73.9	19.3	107	269	
Vert.	4944.000	PK	45.92	31.93	6.42	38.55	2.28	48.00	73.9	25.9	255	5	
Vert.	7416.000	PK	45.33	37.57	7.93	39.47	2.28	53.64	73.9	20.2	150	0	
Vert.	9888.000	PK	46.35	39.50	9.13	39.53	2.28	57.73	73.9	**16.1**	150	0	
Vert.	14832.000	PK	47.16	40.92	11.33	40.93	-9.54	48.94	73.9	24.9	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.59	28.24	14.17	41.62	0.86	2.28	42.52	53.9	11.3	*1)
Hori.	4944.000	AV	35.98	31.93	6.42	38.55	0.86	2.28	38.92	53.9	14.9	
Hori.	7416.000	AV	35.54	37.57	7.93	39.47	0.86	2.28	44.71	53.9	9.1	
Hori.	9888.000	AV	35.95	39.50	9.13	39.53	0.86	2.28	48.19	53.9	5.7	
Hori.	14832.000	AV	37.61	40.92	11.33	40.93	0.86	-9.54	40.25	53.9	13.6	
Vert.	2483.500	AV	39.30	28.24	14.17	41.62	0.86	2.28	43.23	53.9	10.6	*1)
Vert.	2492.836	AV	40.12	28.23	14.17	41.63	0.86	2.28	44.03	53.9	9.8	
Vert.	4944.000	AV	36.12	31.93	6.42	38.55	0.86	2.28	39.06	53.9	14.8	
Vert.	7416.000	AV	35.66	37.57	7.93	39.47	0.86	2.28	44.83	53.9	9.0	
Vert.	9888.000	AV	36.08	39.50	9.13	39.53	0.86	2.28	48.32	53.9	**5.5**	
Vert.	14832.000	AV	37.38	40.92	11.33	40.93	0.86	-9.54	40.02	53.9	13.8	

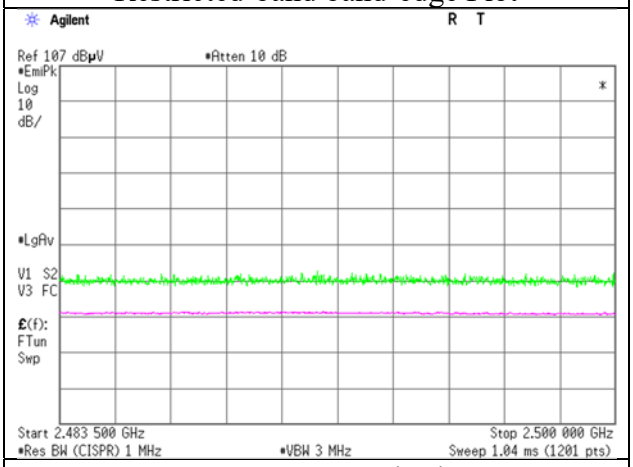
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada
Mode	Tx 11b 2472 MHz

Horizontal

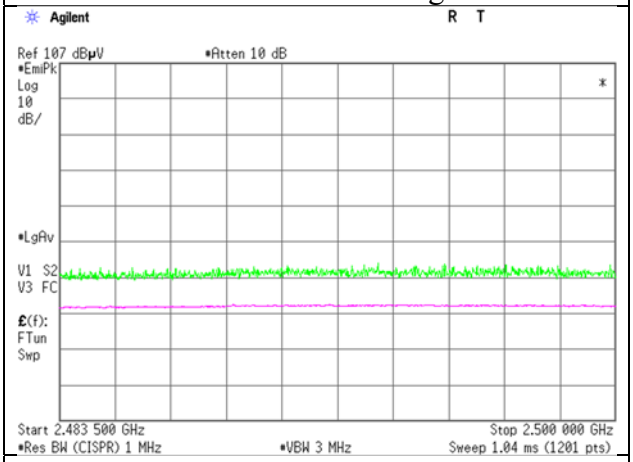
Restricted-band band-edge Plot



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

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.2	No.2	No.3	No.3
Date	February 10, 2020	February 10, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	23 deg. C / 32 % RH	23 deg. C / 32 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx OFDM VHT 20 2412 MHz MIMO			

(* 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.	2261.240	PK	49.18	28.71	13.90	38.76	2.28	55.31	73.9	18.5	238	227	
Hori.	2390.000	PK	59.91	28.33	14.08	41.59	2.28	63.01	73.9	**10.8**	158	116	
Hori.	4824.000	PK	48.25	31.71	6.35	38.55	2.28	50.04	73.9	23.8	144	162	
Hori.	7236.000	PK	46.10	37.32	7.80	39.20	2.28	54.30	73.9	19.6	150	161	
Hori.	14472.000	PK	47.28	41.37	11.14	41.45	-9.54	48.80	73.9	25.1	150	0	
Vert.	2261.240	PK	49.26	28.71	13.90	38.76	2.28	55.39	73.9	18.5	155	89	
Vert.	2390.000	PK	56.22	28.33	14.08	41.59	2.28	59.32	73.9	14.5	148	117	
Vert.	4824.000	PK	48.01	31.71	6.35	38.55	2.28	49.80	73.9	24.1	148	213	
Vert.	7236.000	PK	46.07	37.32	7.80	39.20	2.28	54.27	73.9	19.6	150	0	
Vert.	14472.000	PK	47.39	41.37	11.14	41.45	-9.54	48.91	73.9	24.9	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2261.240	AV	41.31	28.71	13.90	38.76	3.34	2.28	50.78	53.9	**3.1**	
Hori.	2390.000	AV	42.53	28.33	14.08	41.59	3.34	2.28	48.97	53.9	4.9	*1)
Hori.	4824.000	AV	37.61	31.71	6.35	38.55	3.34	2.28	42.74	53.9	11.1	
Hori.	7236.000	AV	35.60	37.32	7.80	39.20	3.34	2.28	47.14	53.9	6.7	
Hori.	14472.000	AV	37.71	41.37	11.14	41.45	3.34	-9.54	42.57	53.9	11.3	
Vert.	2261.240	AV	40.49	28.71	13.90	38.76	3.34	2.28	49.96	53.9	3.9	
Vert.	2390.000	AV	43.68	28.33	14.08	41.59	3.34	2.28	50.12	53.9	3.7	*1)
Vert.	4824.000	AV	37.15	31.71	6.35	38.55	3.34	2.28	42.28	53.9	11.6	
Vert.	7236.000	AV	35.68	37.32	7.80	39.20	3.34	2.28	47.22	53.9	6.6	
Vert.	14472.000	AV	37.62	41.37	11.14	41.45	3.34	-9.54	42.48	53.9	11.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

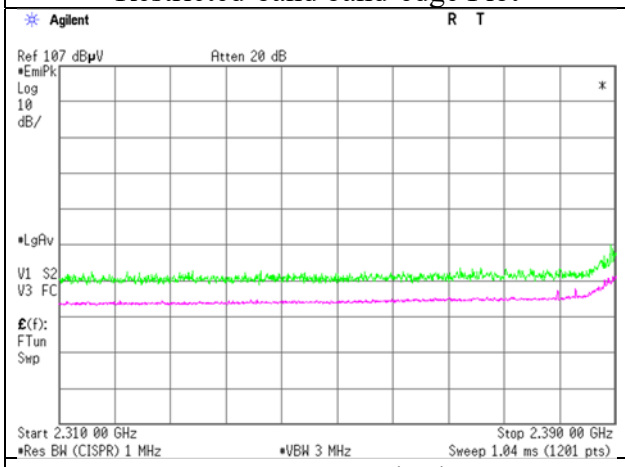
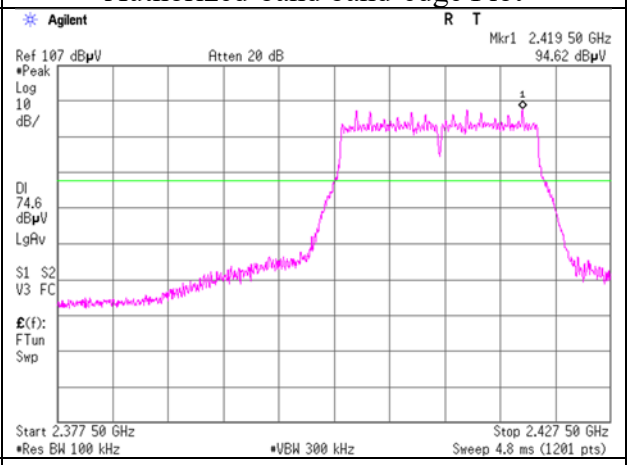
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

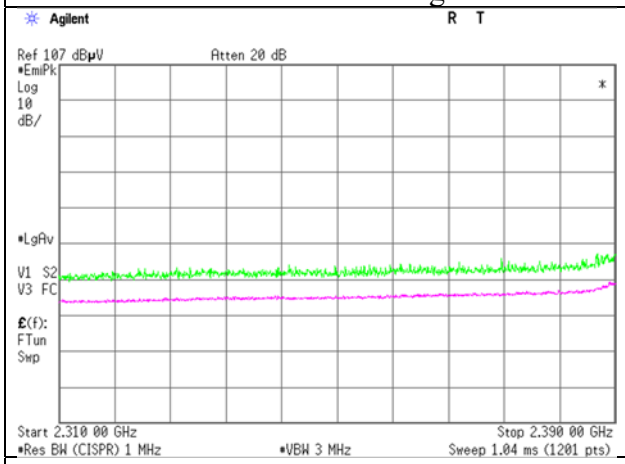
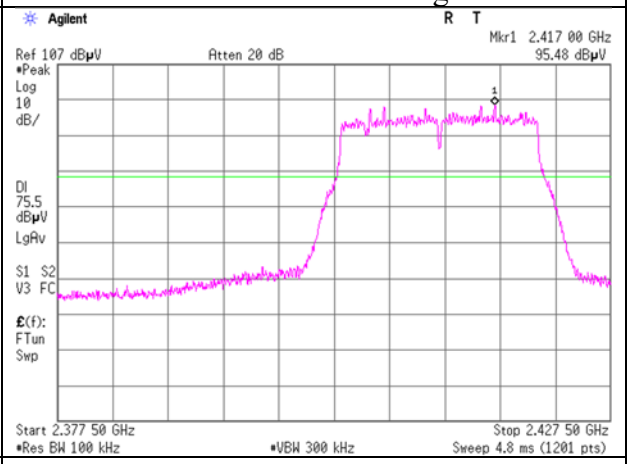
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	94.60	28.29	14.09	41.60	2.28	97.66	-	-	
Hori.	2400.000	PK	55.51	28.31	14.08	41.60	2.28	58.58	77.66	19.0	
Vert.	2412.000	PK	95.65	28.29	14.09	41.60	2.28	98.71	-	-	
Vert.	2400.000	PK	51.61	28.31	14.08	41.60	2.28	54.68	78.71	24.0	

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

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 10, 2020
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Makoto Hosaka
Mode	Tx OFDM VHT 20 2412 MHz MIMO

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	13211388S-D				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.2	No.3	No.3
Date	February 27, 2020	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	23 deg. C / 37 % RH	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(30 MHz - 1000 MHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx OFDM VHT 20 2437 MHz MIMO				

(* 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.	84.793	QP	41.53	7.04	7.62	32.15	0.00	24.04	40.0	15.9	210	290	
Hori.	124.996	QP	37.38	13.40	7.35	32.11	0.00	26.02	43.5	17.4	312	244	
Hori.	249.992	QP	51.22	11.60	8.42	31.99	0.00	39.25	46.0	**6.7**	167	318	
Hori.	340.910	QP	40.87	14.59	9.02	31.94	0.00	32.54	46.0	13.4	100	256	
Hori.	350.005	QP	39.33	14.80	9.07	31.93	0.00	31.27	46.0	14.7	100	222	
Hori.	499.998	QP	40.65	17.48	9.62	31.92	0.00	35.83	46.0	10.1	100	22	
Hori.	725.021	QP	31.71	19.82	10.45	31.81	0.00	30.17	46.0	15.8	140	133	
Hori.	953.005	QP	34.18	21.55	11.17	30.61	0.00	36.29	46.0	9.7	100	224	
Hori.	4874.000	PK	47.57	31.73	6.39	38.55	2.28	49.42	73.9	24.4	135	164	
Hori.	7311.000	PK	45.72	37.40	7.86	39.31	2.28	53.95	73.9	19.9	150	0	
Hori.	14622.000	PK	47.78	41.44	11.21	41.23	-9.54	49.66	73.9	24.2	150	0	
Vert.	38.420	QP	35.54	15.26	6.63	32.17	0.00	25.26	40.0	14.7	100	213	
Vert.	47.262	QP	37.43	12.05	6.79	32.16	0.00	24.11	40.0	15.8	100	76	
Vert.	51.321	QP	39.30	10.61	6.79	32.16	0.00	24.54	40.0	15.4	100	185	
Vert.	87.715	QP	39.42	7.65	7.60	32.14	0.00	22.53	40.0	17.4	100	154	
Vert.	249.992	QP	48.12	11.60	8.42	31.99	0.00	36.15	46.0	9.8	100	69	
Vert.	267.325	QP	44.76	12.41	8.54	31.98	0.00	33.73	46.0	12.2	100	252	
Vert.	344.998	QP	37.87	14.71	9.04	31.94	0.00	29.68	46.0	16.3	203	332	
Vert.	650.174	QP	33.51	18.99	10.17	31.95	0.00	30.72	46.0	15.2	100	159	
Vert.	953.005	QP	24.59	21.55	11.17	30.61	0.00	26.70	46.0	19.3	140	137	
Vert.	4874.000	PK	48.00	31.73	6.39	38.55	2.28	49.85	73.9	24.0	191	132	
Vert.	7311.000	PK	44.69	37.40	7.86	39.31	2.28	52.92	73.9	20.9	150	0	
Vert.	14622.000	PK	47.31	41.44	11.21	41.23	-9.54	49.19	73.9	24.7	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	37.24	31.73	6.39	38.55	3.34	2.28	42.43	53.9	11.4	
Hori.	7311.000	AV	35.37	37.40	7.86	39.31	3.34	2.28	46.94	53.9	6.9	
Hori.	14622.000	AV	37.48	41.44	11.21	41.23	3.34	-9.54	42.70	53.9	11.2	
Vert.	4874.000	AV	37.10	31.73	6.39	38.55	3.34	2.28	42.29	53.9	11.6	
Vert.	7311.000	AV	35.48	37.40	7.86	39.31	3.34	2.28	47.05	53.9	**6.8**	
Vert.	14622.000	AV	37.62	41.44	11.21	41.23	3.34	-9.54	42.84	53.9	11.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx OFDM VHT 20 2462 MHz MIMO			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	57.95	28.24	14.17	41.62	2.28	61.02	73.9	**12.8**	146	139	
Hori.	4924.000	PK	46.80	31.85	6.41	38.55	2.28	48.79	73.9	25.1	143	172	
Hori.	7386.000	PK	45.83	37.51	7.91	39.43	2.28	54.10	73.9	19.8	150	0	
Hori.	14772.000	PK	47.28	41.15	11.30	41.02	-9.54	49.17	73.9	24.7	150	0	
Vert.	2483.500	PK	57.45	28.24	14.17	41.62	2.28	60.52	73.9	13.3	147	91	
Vert.	4924.000	PK	47.00	31.85	6.41	38.55	2.28	48.99	73.9	24.9	133	156	
Vert.	7386.000	PK	45.31	37.51	7.91	39.43	2.28	53.58	73.9	20.3	150	0	
Vert.	14772.000	PK	47.45	41.15	11.30	41.02	-9.54	49.34	73.9	24.5	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.89	28.24	14.17	41.62	3.34	2.28	47.30	53.9	6.6	*1)
Hori.	4924.000	AV	36.90	31.85	6.41	38.55	3.34	2.28	42.23	53.9	11.6	
Hori.	7386.000	AV	35.71	37.51	7.91	39.43	3.34	2.28	47.32	53.9	6.5	
Hori.	14772.000	AV	37.39	41.15	11.30	41.02	3.34	-9.54	42.62	53.9	11.2	
Vert.	2483.500	AV	41.79	28.24	14.17	41.62	3.34	2.28	48.20	53.9	**5.7**	*1)
Vert.	4924.000	AV	36.50	31.85	6.41	38.55	3.34	2.28	41.83	53.9	12.0	
Vert.	7386.000	AV	35.49	37.51	7.91	39.43	3.34	2.28	47.10	53.9	6.8	
Vert.	14772.000	AV	37.49	41.15	11.30	41.02	3.34	-9.54	42.72	53.9	11.1	

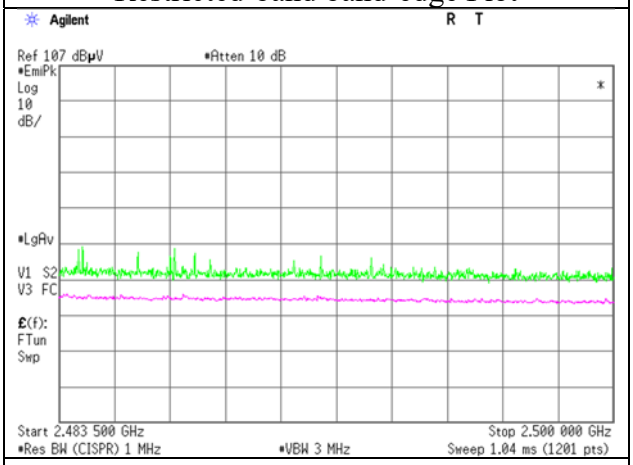
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
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 OFDM VHT 20 2462 MHz MIMO

Horizontal

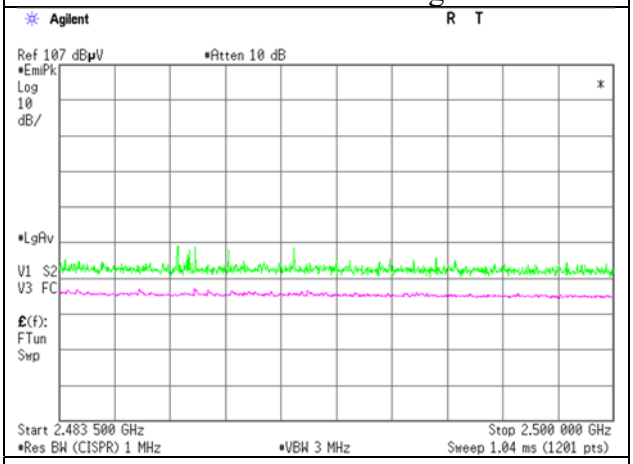
Restricted-band band-edge Plot



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-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx OFDM VHT 20 2467 MHz MIMO			

(* 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.	2312.800	PK	50.59	28.48	14.01	41.57	2.28	53.79	73.9	20.1	137	160	
Hori.	2483.500	PK	50.96	28.24	14.17	41.62	2.28	54.03	73.9	**19.8**	135	138	
Hori.	4934.000	PK	45.75	31.89	6.42	38.55	2.28	47.79	73.9	26.1	157	153	
Hori.	7401.000	PK	44.83	37.54	7.93	39.45	2.28	53.13	73.9	20.7	150	0	
Hori.	14802.000	PK	46.71	41.04	11.32	40.98	-9.54	48.55	73.9	25.3	150	0	
Vert.	2312.800	PK	50.21	28.48	14.01	41.57	2.28	53.41	73.9	20.4	174	165	
Vert.	2483.500	PK	50.91	28.24	14.17	41.62	2.28	53.98	73.9	19.9	147	94	
Vert.	4934.000	PK	45.80	31.89	6.42	38.55	2.28	47.84	73.9	26.0	257	4	
Vert.	7401.000	PK	45.76	37.54	7.93	39.45	2.28	54.06	73.9	**19.8**	150	0	
Vert.	14802.000	PK	47.43	41.04	11.32	40.98	-9.54	49.27	73.9	24.6	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2312.800	AV	40.37	28.48	14.01	41.57	3.34	2.28	46.91	53.9	6.9	
Hori.	2483.500	AV	39.94	28.24	14.17	41.62	3.34	2.28	46.35	53.9	7.5	*1)
Hori.	4934.000	AV	36.04	31.89	6.42	38.55	3.34	2.28	41.42	53.9	12.4	
Hori.	7401.000	AV	35.62	37.54	7.93	39.45	3.34	2.28	47.26	53.9	6.6	
Hori.	14802.000	AV	37.47	41.04	11.32	40.98	3.34	-9.54	42.65	53.9	11.2	
Vert.	2312.800	AV	40.49	28.48	14.01	41.57	3.34	2.28	47.03	53.9	6.8	
Vert.	2483.500	AV	40.97	28.24	14.17	41.62	3.34	2.28	47.38	53.9	**6.5**	*1)
Vert.	4934.000	AV	36.24	31.89	6.42	38.55	3.34	2.28	41.62	53.9	12.2	
Vert.	7401.000	AV	35.57	37.54	7.93	39.45	3.34	2.28	47.21	53.9	6.6	
Vert.	14802.000	AV	37.39	41.04	11.32	40.98	3.34	-9.54	42.57	53.9	11.3	

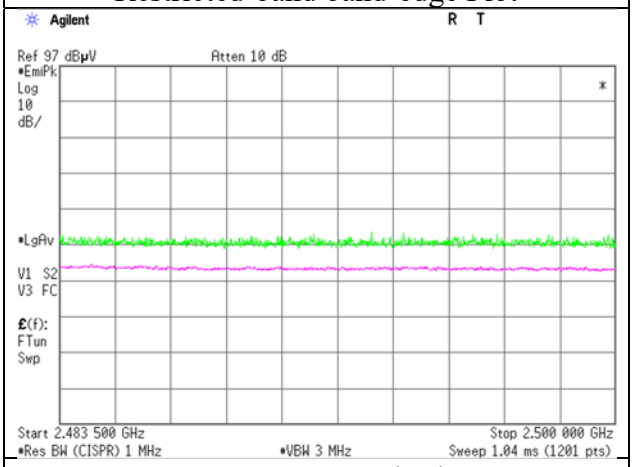
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
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 OFDM VHT 20 2467 MHz MIMO

Horizontal

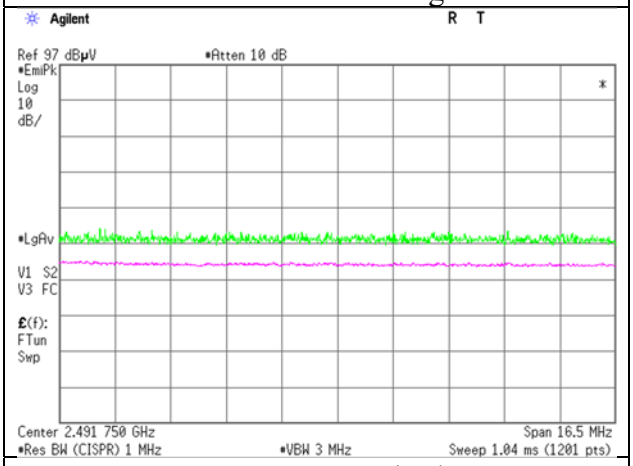
Restricted-band band-edge Plot



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-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx OFDM VHT 20 2472 MHz MIMO			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	51.37	28.24	14.17	41.62	2.28	54.44	73.9	**19.4**	242	123	
Hori.	4944.000	PK	45.82	31.93	6.42	38.55	2.28	47.90	73.9	26.0	158	158	
Hori.	7416.000	PK	45.79	37.57	7.93	39.47	2.28	54.10	73.9	19.8	150	0	
Hori.	14832.000	PK	47.26	40.92	11.33	40.93	-9.54	49.04	73.9	24.8	150	0	
Vert.	2483.500	PK	50.93	28.24	14.17	41.62	2.28	54.00	73.9	19.9	157	113	
Vert.	4944.000	PK	45.35	31.93	6.42	38.55	2.28	47.43	73.9	26.4	398	21	
Vert.	7416.000	PK	45.68	37.57	7.93	39.47	2.28	53.99	73.9	19.9	150	0	
Vert.	14832.000	PK	47.16	40.92	11.33	40.93	-9.54	48.94	73.9	24.9	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	39.77	28.24	14.17	41.62	3.34	2.28	46.18	53.9	7.7	*1)
Hori.	4944.000	AV	35.85	31.93	6.42	38.55	3.34	2.28	41.27	53.9	12.6	
Hori.	7416.000	AV	35.68	37.57	7.93	39.47	3.34	2.28	47.33	53.9	**6.5**	
Hori.	14832.000	AV	37.61	40.92	11.33	40.93	3.34	-9.54	42.73	53.9	11.1	
Vert.	2483.500	AV	40.81	28.24	14.17	41.62	3.34	2.28	47.22	53.9	6.6	*1)
Vert.	4944.000	AV	35.92	31.93	6.42	38.55	3.34	2.28	41.34	53.9	12.5	
Vert.	7416.000	AV	35.73	37.57	7.93	39.47	3.34	2.28	47.38	53.9	**6.5**	
Vert.	14832.000	AV	37.38	40.92	11.33	40.93	3.34	-9.54	42.50	53.9	11.4	

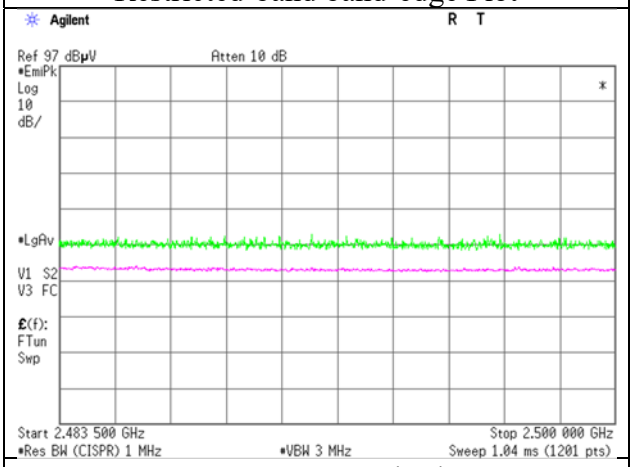
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
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 OFDM VHT 20 2472 MHz MIMO

Horizontal

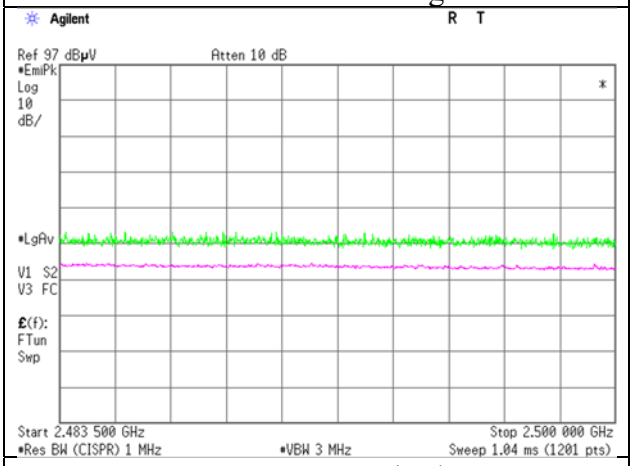
Restricted-band band-edge Plot



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-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2412 MHz SISO

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	56.66	28.33	14.08	41.59	2.28	59.76	73.9	14.1	145	133	
Vert.	2390.000	PK	57.49	28.33	14.08	41.59	2.28	60.59	73.9	**13.3**	277	122	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	41.31	28.33	14.08	41.59	2.03	2.28	46.44	53.9	**7.4**	*1)
Vert.	2390.000	AV	41.28	28.33	14.08	41.59	2.03	2.28	46.41	53.9	**7.4**	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

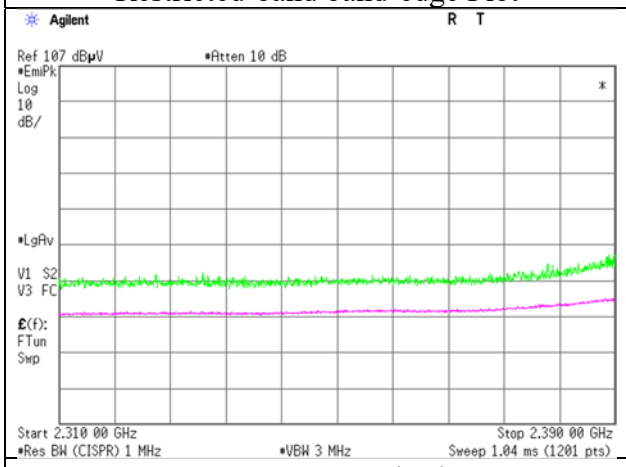
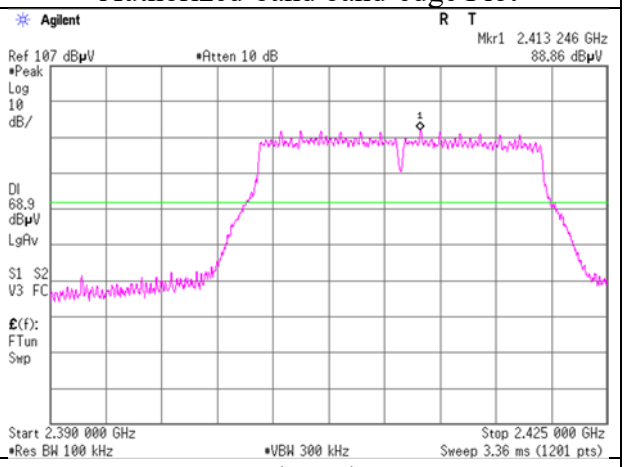
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

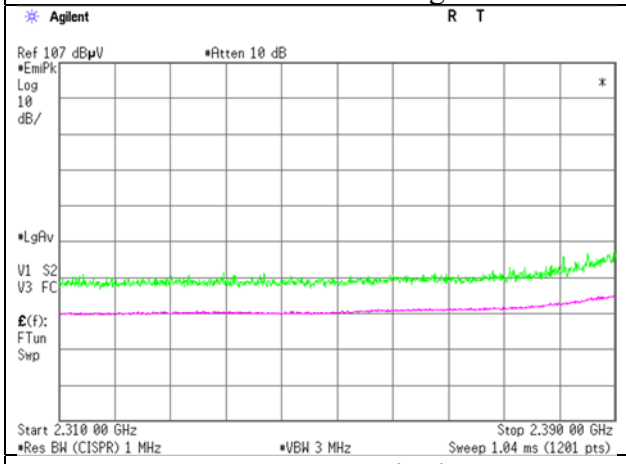
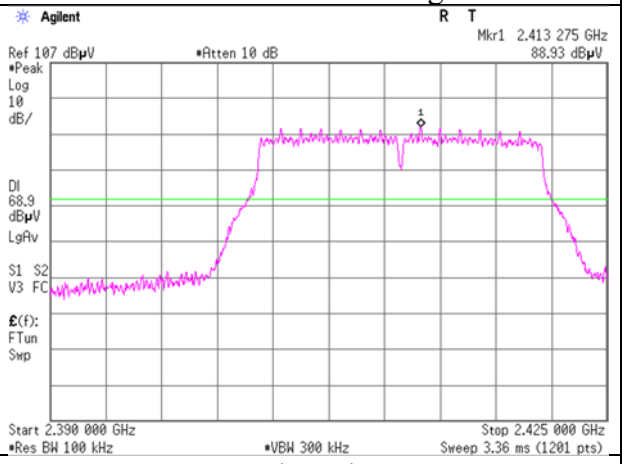
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	88.53	28.29	14.09	41.60	2.28	91.59	-	-	Carrier
Hori.	2400.000	PK	48.50	28.31	14.08	41.60	2.28	51.57	71.59	20.0	
Vert.	2412.000	PK	88.49	28.29	14.09	41.60	2.28	91.55	-	-	Carrier
Vert.	2400.000	PK	49.07	28.31	14.08	41.60	2.28	52.14	71.55	19.4	

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

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada
Mode	Tx 11n-20 2412 MHz SISO

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2462 MHz SISO

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	58.26	28.24	14.17	41.62	2.28	61.33	73.9	12.5	195	135	
Vert.	2483.500	PK	60.32	28.24	14.17	41.62	2.28	63.39	73.9	**10.5**	230	113	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	42.59	28.24	14.17	41.62	2.03	2.28	47.69	53.9	6.2	*1)
Vert.	2483.500	AV	44.15	28.24	14.17	41.62	2.03	2.28	49.25	53.9	**4.6**	*1)

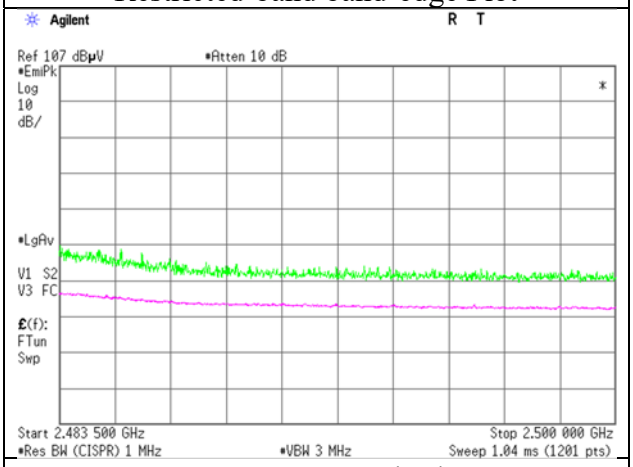
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada
Mode	Tx 11n-20 2462 MHz SISO

Horizontal

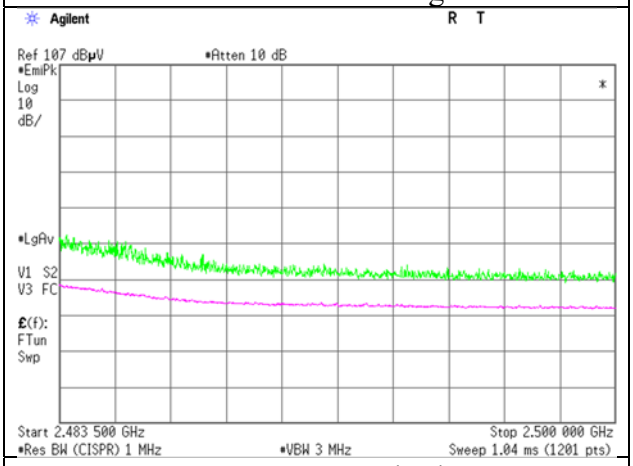
Restricted-band band-edge Plot



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-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2467 MHz SISO

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	50.38	28.24	14.17	41.62	2.28	53.45	73.9	**20.4**	213	147	
Vert.	2483.500	PK	49.78	28.24	14.17	41.62	2.28	52.85	73.9	21.0	115	229	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	39.05	28.24	14.17	41.62	2.03	2.28	44.15	53.9	**9.7**	*1)
Vert.	2483.500	AV	38.51	28.24	14.17	41.62	2.03	2.28	43.61	53.9	10.2	*1)

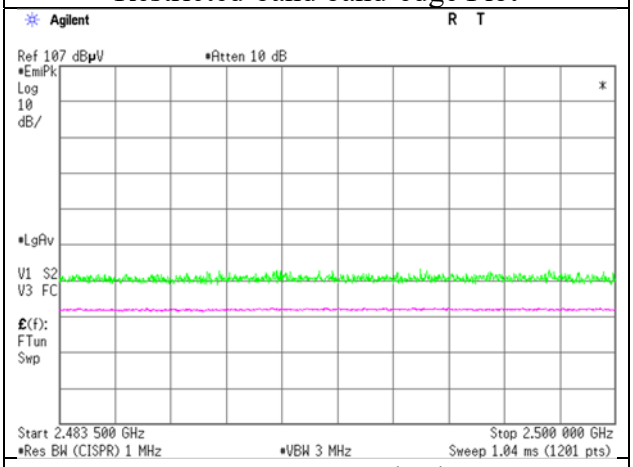
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada
Mode	Tx 11n-20 2467 MHz SISO

Horizontal

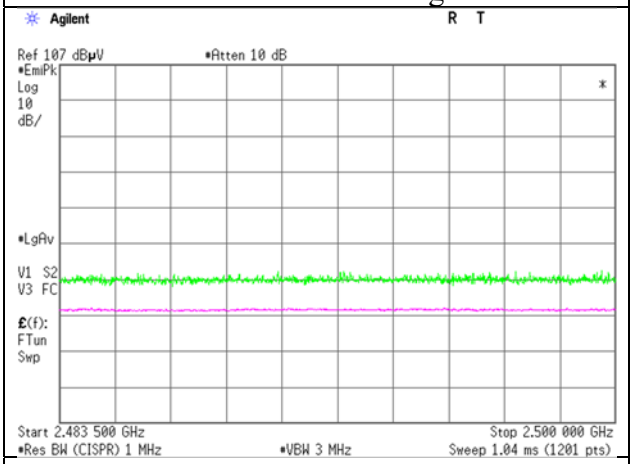
Restricted-band band-edge Plot



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-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2472 MHz SISO

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	50.27	28.24	14.17	41.62	2.28	53.34	73.9	**20.5**	185	139	
Vert.	2483.500	PK	49.97	28.24	14.17	41.62	2.28	53.04	73.9	20.8	233	111	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.68	28.24	14.17	41.62	2.03	2.28	43.78	53.9	**10.1**	*1)
Vert.	2483.500	AV	38.54	28.24	14.17	41.62	2.03	2.28	43.64	53.9	10.2	*1)

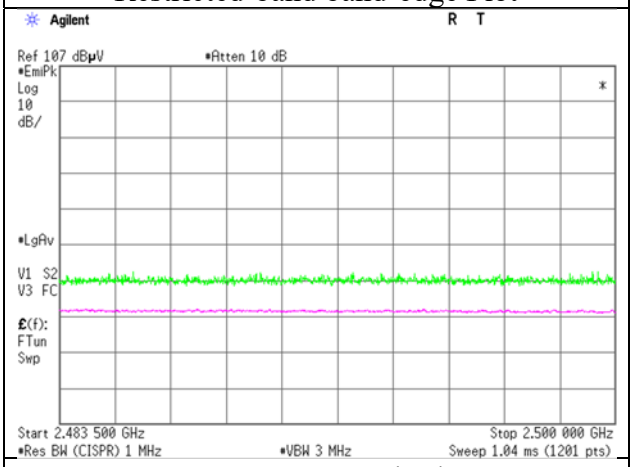
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2020
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Toshinori Yamada
Mode	Tx 11n-20 2472 MHz SISO

Horizontal

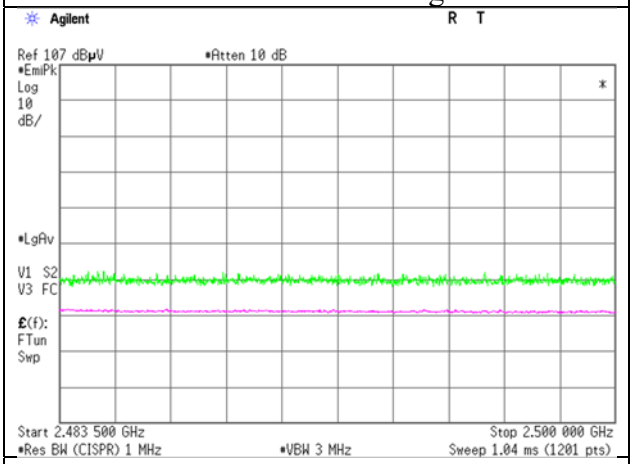
Restricted-band band-edge Plot



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-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11n-40 2422 MHz MIMO			

(* 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.	2388.967	PK	56.94	28.33	14.08	41.59	2.28	60.04	73.9	**13.8**	191	132	
Hori.	2390.000	PK	53.67	28.33	14.08	41.59	2.28	56.77	73.9	17.1	191	132	
Hori.	4844.000	PK	46.08	31.72	6.36	38.55	2.28	47.89	73.9	26.0	140	162	
Hori.	7266.000	PK	45.80	37.35	7.84	39.24	2.28	54.03	73.9	19.8	150	0	
Hori.	14532.000	PK	47.74	41.41	11.15	41.36	-9.54	49.40	73.9	24.5	150	0	
Vert.	2385.200	PK	54.42	28.34	14.07	41.59	2.28	57.52	73.9	16.3	147	96	
Vert.	2390.000	PK	54.37	28.33	14.08	41.59	2.28	57.47	73.9	16.4	147	96	
Vert.	4844.000	PK	45.61	31.72	6.36	38.55	2.28	47.42	73.9	26.4	161	166	
Vert.	7266.000	PK	44.72	37.35	7.84	39.24	2.28	52.95	73.9	20.9	150	0	
Vert.	14532.000	PK	47.98	41.41	11.15	41.36	-9.54	49.64	73.9	24.2	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2388.967	AV	42.36	28.33	14.08	41.59	5.12	2.28	50.58	53.9	3.3	
Hori.	2390.000	AV	41.21	28.33	14.08	41.59	5.12	2.28	49.43	53.9	4.4	*1)
Hori.	4844.000	AV	36.17	31.72	6.36	38.55	5.12	2.28	43.10	53.9	10.8	
Hori.	7266.000	AV	35.32	37.35	7.84	39.24	5.12	2.28	48.67	53.9	5.2	
Hori.	14532.000	AV	37.91	41.41	11.15	41.36	5.12	-9.54	44.69	53.9	9.2	
Vert.	2385.200	AV	42.82	28.34	14.07	41.59	5.12	2.28	51.04	53.9	**2.8**	
Vert.	2390.000	AV	41.85	28.33	14.08	41.59	5.12	2.28	50.07	53.9	3.8	*1)
Vert.	4844.000	AV	35.54	31.72	6.36	38.55	5.12	2.28	42.47	53.9	11.4	
Vert.	7266.000	AV	35.44	37.35	7.84	39.24	5.12	2.28	48.79	53.9	5.1	
Vert.	14532.000	AV	37.89	41.41	11.15	41.36	5.12	-9.54	44.67	53.9	9.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

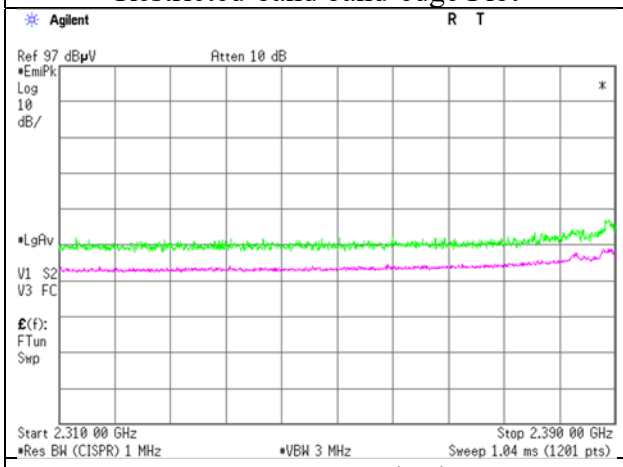
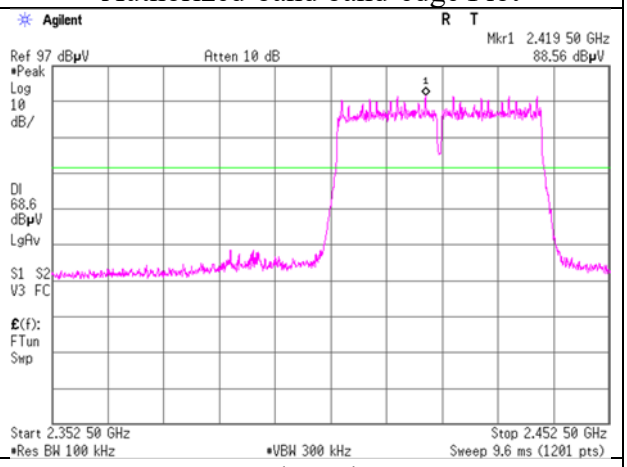
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

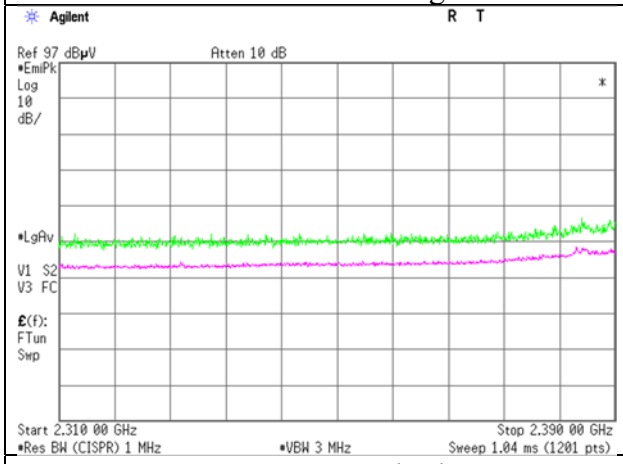
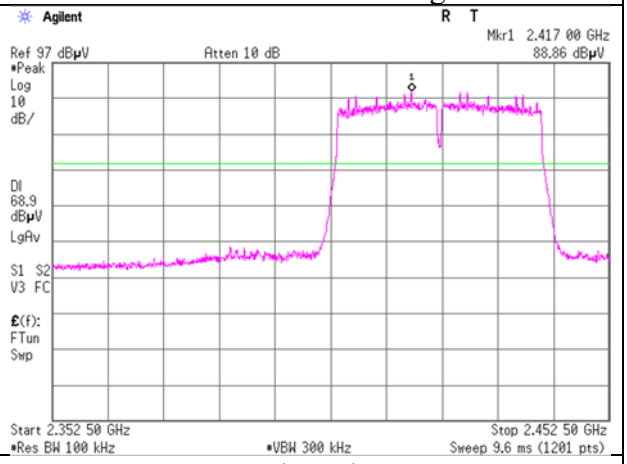
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2422.000	PK	88.53	28.28	14.11	41.60	2.28	91.60	-	-	
Hori.	2400.000	PK	44.36	28.31	14.08	41.60	2.28	47.43	71.60	24.1	
Vert.	2422.000	PK	88.82	28.28	14.11	41.60	2.28	91.89	-	-	
Vert.	2400.000	PK	44.16	28.31	14.08	41.60	2.28	47.23	71.89	24.6	

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

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 10, 2020
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-40 2422 MHz MIMO

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka (1 GHz -2.8 GHz)	Makoto Hosaka (2.8 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)
Mode	Tx 11n-40 2437 MHz MIMO			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	46.26	31.73	6.39	38.55	2.28	48.11	73.9	25.7	137	160	
Hori.	7311.000	PK	44.78	37.40	7.86	39.31	2.28	53.01	73.9	20.8	150	0	
Hori.	14622.000	PK	47.11	41.44	11.21	41.23	-9.54	48.99	73.9	24.9	150	0	
Vert.	4874.000	PK	45.98	31.73	6.39	38.55	2.28	47.83	73.9	26.0	384	14	
Vert.	7311.000	PK	45.32	37.40	7.86	39.31	2.28	53.55	73.9	**20.3**	150	0	
Vert.	14622.000	PK	46.94	41.44	11.21	41.23	-9.54	48.82	73.9	25.0	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	36.27	31.73	6.39	38.55	5.12	2.28	43.24	53.9	10.6	
Hori.	7311.000	AV	35.48	37.40	7.86	39.31	5.12	2.28	48.83	53.9	**5.0**	
Hori.	14622.000	AV	37.57	41.44	11.21	41.23	5.12	-9.54	44.57	53.9	9.3	
Vert.	4874.000	AV	35.83	31.73	6.39	38.55	5.12	2.28	42.80	53.9	11.1	
Vert.	7311.000	AV	35.43	37.40	7.86	39.31	5.12	2.28	48.78	53.9	5.1	
Vert.	14622.000	AV	37.44	41.44	11.21	41.23	5.12	-9.54	44.44	53.9	9.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11n-40 2457 MHz MIMO			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	52.03	28.24	14.17	41.62	2.28	55.10	73.9	18.8	323	135	
Hori.	4914.000	PK	45.88	31.81	6.41	38.55	2.28	47.83	73.9	26.0	139	158	
Hori.	7371.000	PK	45.75	37.48	7.89	39.40	2.28	54.00	73.9	19.9	150	0	
Hori.	14742.000	PK	47.50	41.24	11.27	41.06	-9.54	49.41	73.9	24.4	150	0	
Vert.	2483.500	PK	52.77	28.24	14.17	41.62	2.28	55.84	73.9	**18.0**	148	101	
Vert.	4914.000	PK	45.80	31.81	6.41	38.55	2.28	47.75	73.9	26.1	268	351	
Vert.	7371.000	PK	44.97	37.48	7.89	39.40	2.28	53.22	73.9	20.6	150	0	
Vert.	14742.000	PK	47.33	41.24	11.27	41.06	-9.54	49.24	73.9	24.6	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.39	28.24	14.17	41.62	5.12	2.28	48.58	53.9	5.3	*1)
Hori.	4914.000	AV	36.24	31.81	6.41	38.55	5.12	2.28	43.31	53.9	10.5	
Hori.	7371.000	AV	35.46	37.48	7.89	39.40	5.12	2.28	48.83	53.9	5.0	
Hori.	14742.000	AV	37.22	41.24	11.27	41.06	5.12	-9.54	44.25	53.9	9.6	
Vert.	2483.500	AV	41.43	28.24	14.17	41.62	5.12	2.28	49.62	53.9	**4.2**	*1)
Vert.	4914.000	AV	36.03	31.81	6.41	38.55	5.12	2.28	43.10	53.9	10.8	
Vert.	7371.000	AV	35.44	37.48	7.89	39.40	5.12	2.28	48.81	53.9	5.0	
Vert.	14742.000	AV	37.40	41.24	11.27	41.06	5.12	-9.54	44.43	53.9	9.4	

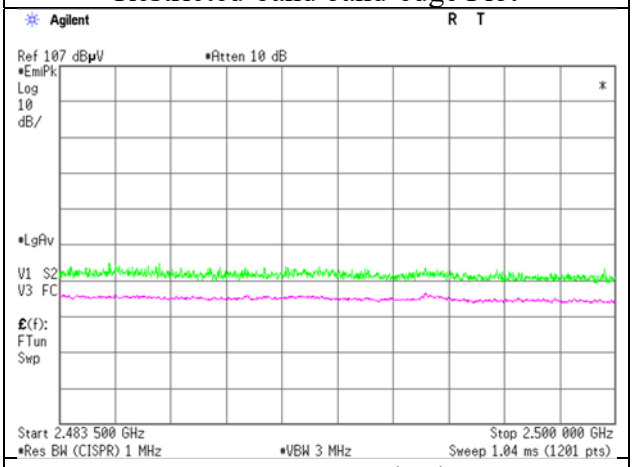
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
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-40 2457 MHz MIMO

Horizontal

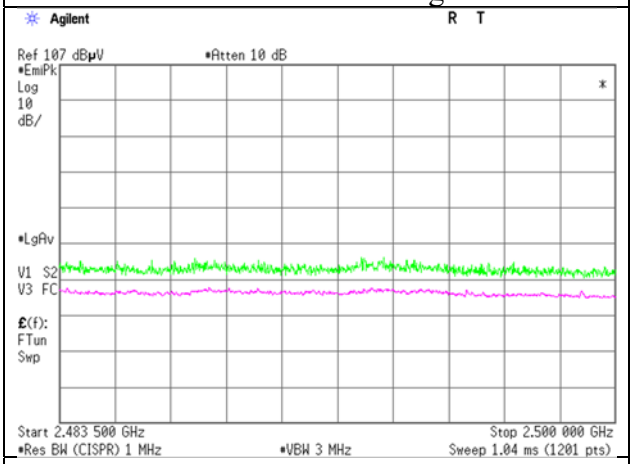
Restricted-band band-edge Plot



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-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx 11n-40 2462 MHz MIMO			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	55.86	28.24	14.17	41.62	2.28	58.93	73.9	14.9	241	135	
Hori.	4924.000	PK	45.15	31.85	6.41	38.55	2.28	47.14	73.9	26.7	131	161	
Hori.	7386.000	PK	45.21	37.51	7.91	39.43	2.28	53.48	73.9	20.4	150	0	
Hori.	14772.000	PK	47.36	41.15	11.30	41.02	-9.54	49.25	73.9	24.6	150	0	
Vert.	2483.500	PK	56.23	28.24	14.17	41.62	2.28	59.30	73.9	**14.6**	142	100	
Vert.	4924.000	PK	45.26	31.85	6.41	38.55	2.28	47.25	73.9	26.6	256	352	
Vert.	7386.000	PK	44.96	37.51	7.91	39.43	2.28	53.23	73.9	20.6	150	0	
Vert.	14772.000	PK	47.48	41.15	11.30	41.02	-9.54	49.37	73.9	24.5	150	0	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.82	28.24	14.17	41.62	5.12	2.28	49.01	53.9	4.8	*1)
Hori.	4924.000	AV	35.87	31.85	6.41	38.55	5.12	2.28	42.98	53.9	10.9	
Hori.	7386.000	AV	35.59	37.51	7.91	39.43	5.12	2.28	48.98	53.9	4.9	
Hori.	14772.000	AV	37.46	41.15	11.30	41.02	5.12	-9.54	44.47	53.9	9.4	
Vert.	2483.500	AV	41.50	28.24	14.17	41.62	5.12	2.28	49.69	53.9	**4.2**	*1)
Vert.	4924.000	AV	36.09	31.85	6.41	38.55	5.12	2.28	43.20	53.9	10.7	
Vert.	7386.000	AV	35.52	37.51	7.91	39.43	5.12	2.28	48.91	53.9	4.9	
Vert.	14772.000	AV	37.38	41.15	11.30	41.02	5.12	-9.54	44.39	53.9	9.5	

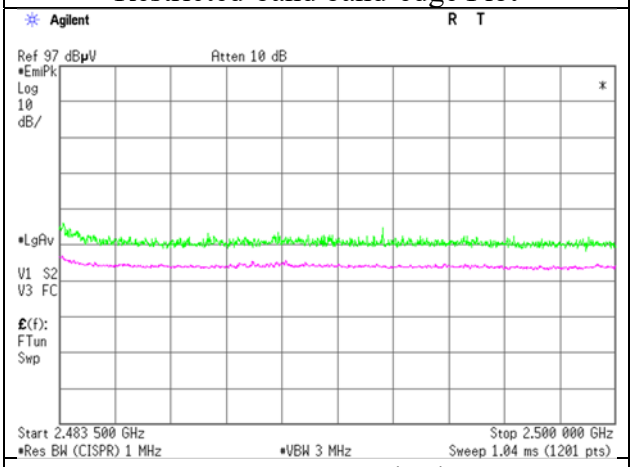
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
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-40 2462 MHz MIMO

Horizontal

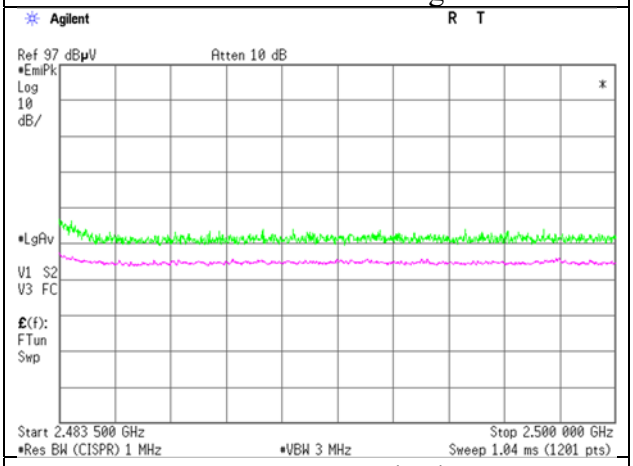
Restricted-band band-edge Plot



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-D
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-40 2422 MHz SISO

(* 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.	2384.608	PK	54.16	28.35	14.07	41.59	2.28	57.27	73.9	16.6	223	231	
Hori.	2389.186	PK	56.54	28.33	14.08	41.59	2.28	59.64	73.9	**14.2**	223	231	
Hori.	2390.000	PK	54.38	28.33	14.08	41.59	2.28	57.48	73.9	16.4	223	231	
Vert.	2384.608	PK	55.11	28.35	14.07	41.59	2.28	58.22	73.9	15.6	150	95	
Vert.	2389.186	PK	56.20	28.33	14.08	41.59	2.28	59.30	73.9	14.6	150	95	
Vert.	2390.000	PK	54.18	28.33	14.08	41.59	2.28	57.28	73.9	16.6	150	95	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2384.608	AV	41.26	28.35	14.07	41.59	3.48	2.28	47.85	53.9	6.0	
Hori.	2389.186	AV	41.69	28.33	14.08	41.59	3.48	2.28	48.27	53.9	5.6	
Hori.	2390.000	AV	42.11	28.33	14.08	41.59	3.48	2.28	48.69	53.9	5.2	*1)
Vert.	2384.608	AV	42.50	28.35	14.07	41.59	3.48	2.28	49.09	53.9	4.8	
Vert.	2389.186	AV	42.63	28.33	14.08	41.59	3.48	2.28	49.21	53.9	**4.6**	
Vert.	2390.000	AV	42.59	28.33	14.08	41.59	3.48	2.28	49.17	53.9	4.7	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
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
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

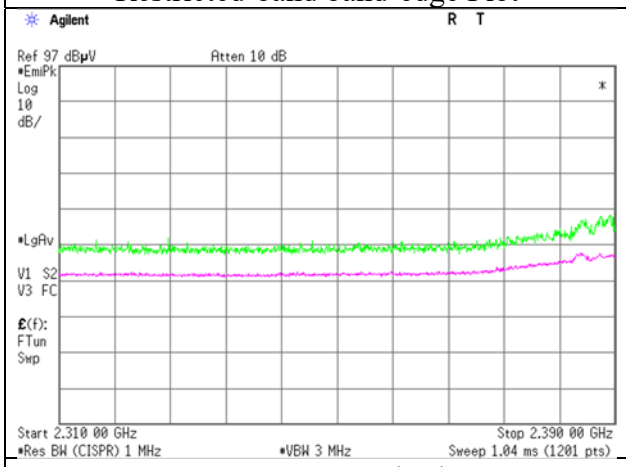
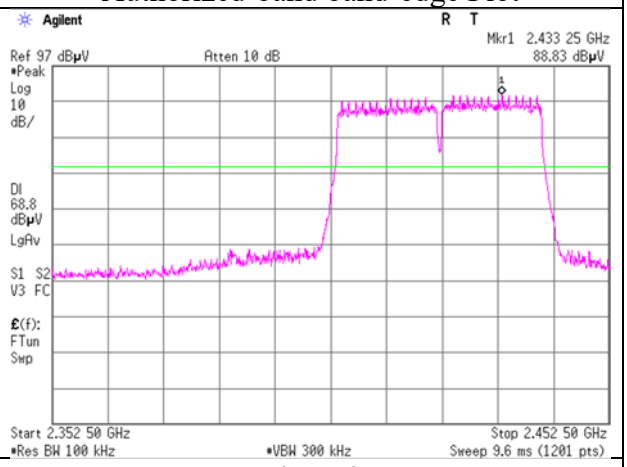
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

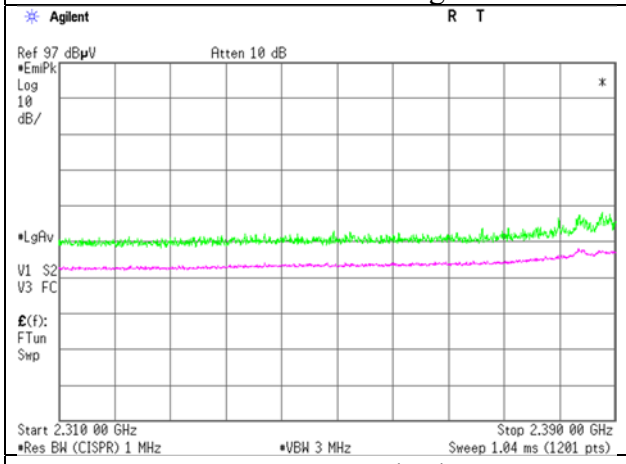
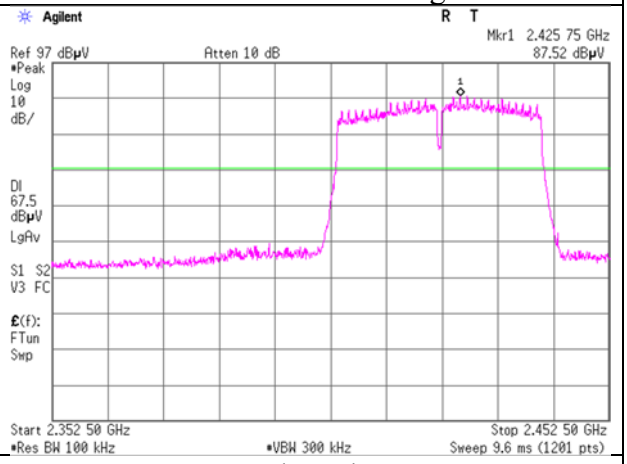
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2422.000	PK	88.83	28.28	14.11	41.60	2.28	91.90	-	-	Carrier
Hori.	2400.000	PK	45.81	28.31	14.08	41.60	2.28	48.88	71.90	23.0	
Vert.	2422.000	PK	87.61	28.28	14.11	41.60	2.28	90.68	-	-	Carrier
Vert.	2400.000	PK	44.55	28.31	14.08	41.60	2.28	47.62	70.68	23.0	

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

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 10, 2020
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-40 2422 MHz SISO

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	13211388S-D
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-40 2462 MHz SISO

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	60.79	28.24	14.17	41.62	2.28	63.86	73.9	**10.0**	213	233	
Vert.	2483.500	PK	57.71	28.24	14.17	41.62	2.28	60.78	73.9	13.1	147	92	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	44.31	28.24	14.17	41.62	3.48	2.28	50.86	53.9	**3.0**	*1)
Vert.	2483.500	AV	43.51	28.24	14.17	41.62	3.48	2.28	50.06	53.9	3.8	*1)

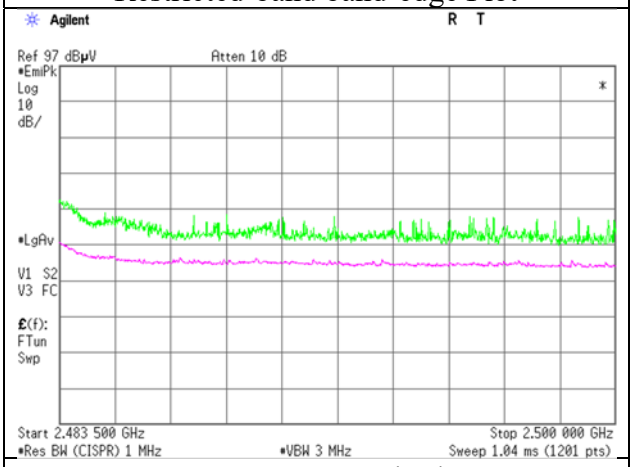
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
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-40 2462 MHz SISO

Horizontal

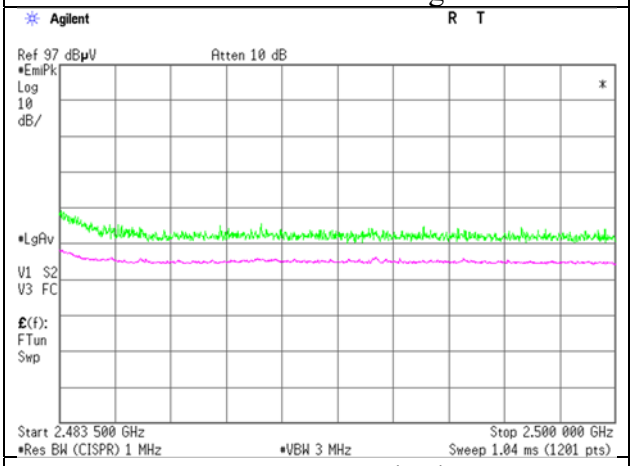
Restricted-band band-edge Plot



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-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 27, 2020	February 7, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	23 deg. C / 37 % RH	23 deg. C / 33 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada	Yusuke Tanikawara	Makoto Hosaka	Toshinori Yamada
	(30 MHz - 1000 MHz)	(1 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx BT LE 2402 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	87.105	QP	42.12	7.53	7.61	32.15	0.00	25.11	40.0	14.8	215	165	
Hori.	120.067	QP	43.75	12.94	7.29	32.12	0.00	31.86	43.5	11.6	292	33	
Hori.	240.106	QP	47.22	11.31	8.35	32.00	0.00	34.88	46.0	11.1	136	213	
Hori.	250.004	QP	48.77	11.60	8.42	31.99	0.00	36.80	46.0	9.2	143	210	
Hori.	259.973	QP	45.93	11.94	8.49	31.98	0.00	34.38	46.0	11.6	133	213	
Hori.	400.015	QP	41.43	15.45	9.26	31.93	0.00	34.21	46.0	11.7	100	194	
Hori.	499.994	QP	36.88	17.48	9.62	31.92	0.00	32.06	46.0	13.9	100	19	
Hori.	816.231	QP	31.47	20.42	10.76	31.55	0.00	31.10	46.0	14.9	107	154	
Hori.	952.247	QP	33.50	21.54	11.17	30.62	0.00	35.59	46.0	10.4	100	221	
Hori.	2390.000	PK	45.11	28.51	14.01	38.68	2.28	51.23	73.9	22.6	161	52	
Hori.	3202.737	PK	48.74	29.26	5.57	38.32	2.28	47.53	73.9	26.3	209	234	
Hori.	4804.000	PK	59.55	31.71	6.34	38.55	2.28	61.33	73.9	12.5	230	169	
Hori.	7206.000	PK	45.76	37.30	7.79	39.15	2.28	53.98	73.9	19.9	150	0	
Hori.	9608.000	PK	44.57	38.78	8.97	39.74	2.28	54.86	73.9	19.0	150	0	
Hori.	12010.000	PK	44.76	39.43	10.26	40.48	2.28	56.25	73.9	17.6	150	0	
Vert.	37.922	QP	35.67	15.45	6.63	32.17	0.00	25.58	40.0	14.4	100	247	
Vert.	48.034	QP	41.80	11.74	6.79	32.16	0.00	28.17	40.0	11.8	100	118	
Vert.	54.705	QP	41.12	9.48	6.77	32.16	0.00	25.21	40.0	14.7	100	121	
Vert.	86.211	QP	42.98	7.34	7.62	32.15	0.00	25.79	40.0	14.2	127	122	
Vert.	120.067	QP	41.90	12.94	7.29	32.12	0.00	30.01	43.5	13.4	100	179	
Vert.	144.099	QP	40.43	14.42	7.72	32.09	0.00	30.48	43.5	13.0	100	258	
Vert.	192.143	QP	38.31	16.27	7.88	32.05	0.00	30.41	43.5	13.0	100	131	
Vert.	249.994	QP	48.86	11.60	8.42	31.99	0.00	36.89	46.0	**9.1**	100	73	
Vert.	267.312	QP	42.55	12.41	8.54	31.98	0.00	31.52	46.0	14.4	100	88	
Vert.	319.392	QP	40.48	13.86	8.89	31.95	0.00	31.28	46.0	14.7	100	323	
Vert.	952.247	QP	29.47	21.54	11.17	30.62	0.00	31.56	46.0	14.4	142	134	
Vert.	2390.000	PK	44.23	28.51	14.01	38.68	2.28	50.35	73.9	23.5	163	83	
Vert.	3202.737	PK	49.41	29.26	5.57	38.32	2.28	48.20	73.9	25.7	211	118	
Vert.	4804.000	PK	60.02	31.71	6.34	38.55	2.28	61.80	73.9	12.1	168	152	
Vert.	7206.000	PK	44.97	37.30	7.79	39.15	2.28	53.19	73.9	20.7	150	0	
Vert.	9608.000	PK	44.21	38.78	8.97	39.74	2.28	54.50	73.9	19.4	150	0	
Vert.	12010.000	PK	44.38	39.43	10.26	40.48	2.28	55.87	73.9	18.0	150	0	

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

Peak measurement value with DCCF

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	45.11	28.51	14.01	38.68	-19.05	2.28	32.18	53.9	21.7	*1)
Hori.	3202.737	PK	48.74	29.26	5.57	38.32	-19.05	2.28	28.48	53.9	25.4	*2)
Hori.	4804.000	PK	59.55	31.71	6.34	38.55	-19.05	2.28	42.28	53.9	11.6	
Hori.	7206.000	PK	45.76	37.30	7.79	39.15	-19.05	2.28	34.93	53.9	19.0	
Hori.	9608.000	PK	44.57	38.78	8.97	39.74	-19.05	2.28	35.81	53.9	18.1	
Hori.	12010.000	PK	44.76	39.43	10.26	40.48	-19.05	2.28	37.20	53.9	16.7	
Vert.	2390.000	PK	44.23	28.51	14.01	38.68	-19.05	2.28	31.30	53.9	22.6	*1)
Vert.	3202.737	PK	49.41	29.26	5.57	38.32	-19.05	2.28	29.15	53.9	24.8	*2)
Vert.	4804.000	PK	60.02	31.71	6.34	38.55	-19.05	2.28	42.75	53.9	**11.2**	
Vert.	7206.000	PK	44.97	37.30	7.79	39.15	-19.05	2.28	34.14	53.9	19.8	
Vert.	9608.000	PK	44.21	38.78	8.97	39.74	-19.05	2.28	35.45	53.9	18.5	
Vert.	12010.000	PK	44.38	39.43	10.26	40.48	-19.05	2.28	36.82	53.9	17.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
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
6400
*1) Not out of band emission (Leakage Power)
*2) Four-thirds of Carrier frequency

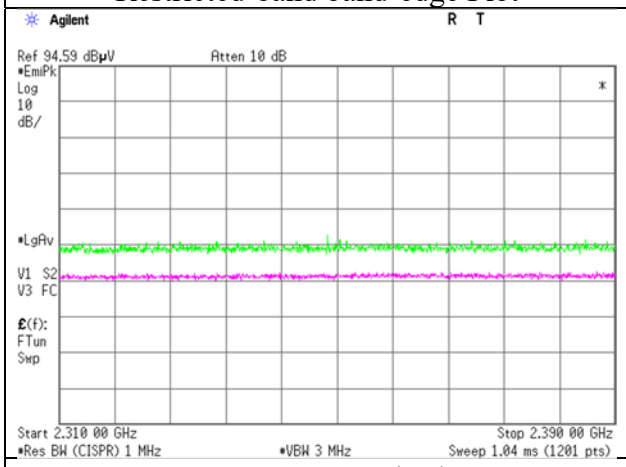
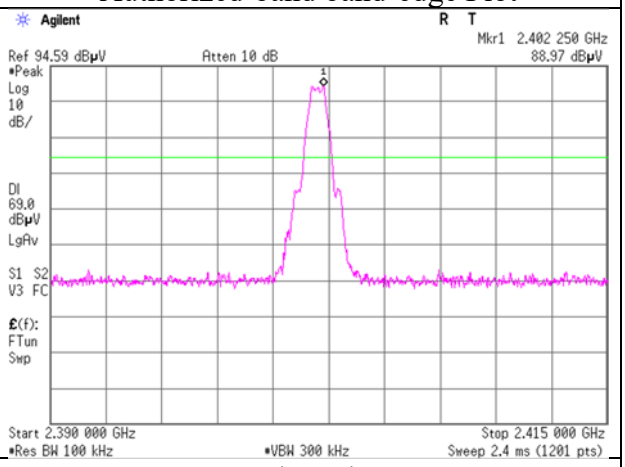
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

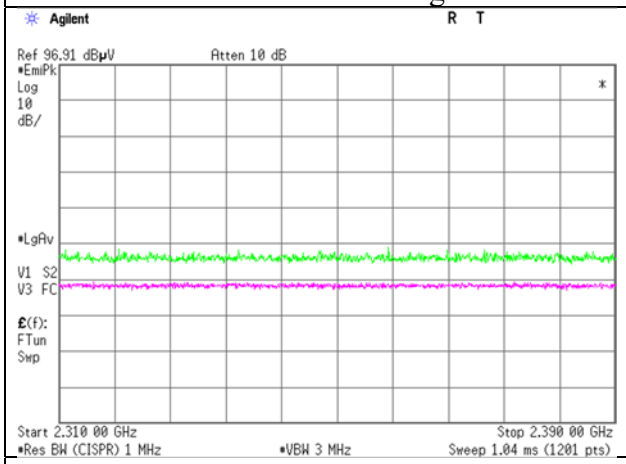
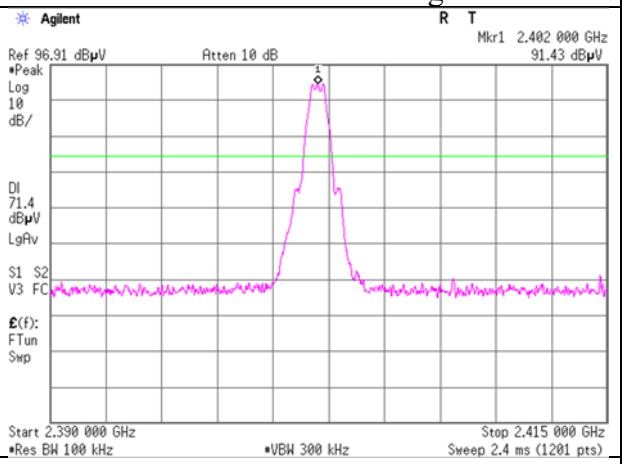
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	89.92	28.48	14.02	38.67	2.28	96.03	-	-	Carrier
Hori.	2400.000	PK	36.56	28.48	14.02	38.67	2.28	42.67	76.03	33.3	
Vert.	2402.000	PK	90.95	28.48	14.02	38.67	2.28	97.06	-	-	Carrier
Vert.	2400.000	PK	36.68	28.48	14.02	38.67	2.28	42.79	77.06	34.2	

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

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 7, 2020
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Yusuke Tanikawara
Mode	Tx BT LE 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 27, 2020	February 7, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	23 deg. C / 37 % RH	23 deg. C / 33 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada	Yusuke Tanikawara	Makoto Hosaka	Toshinori Yamada
	(30 MHz - 1000 MHz)	(1 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx BT LE 2440 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	87.054	QP	42.07	7.52	7.61	32.15	0.00	25.05	40.0	14.9	222	180	
Hori.	120.005	QP	43.54	12.94	7.29	32.12	0.00	31.65	43.5	11.8	295	48	
Hori.	240.107	QP	47.19	11.31	8.35	32.00	0.00	34.85	46.0	11.1	130	203	
Hori.	249.968	QP	48.84	11.60	8.42	31.99	0.00	36.87	46.0	**9.1**	142	205	
Hori.	259.913	QP	45.50	11.94	8.49	31.98	0.00	33.95	46.0	12.0	145	214	
Hori.	399.996	QP	40.77	15.45	9.26	31.93	0.00	33.55	46.0	12.4	100	193	
Hori.	499.994	QP	36.63	17.48	9.62	31.92	0.00	31.81	46.0	14.1	100	16	
Hori.	816.508	QP	31.46	20.42	10.76	31.55	0.00	31.09	46.0	14.9	105	154	
Hori.	952.212	QP	33.62	21.54	11.17	30.62	0.00	35.71	46.0	10.2	100	234	
Hori.	3253.303	PK	49.21	29.06	5.60	38.30	2.28	47.85	73.9	26.0	220	221	
Hori.	4880.000	PK	56.86	31.74	6.39	38.55	2.28	58.72	73.9	15.1	160	165	
Hori.	7320.000	PK	44.94	37.42	7.86	39.33	2.28	53.17	73.9	20.7	150	0	
Hori.	9760.000	PK	45.27	39.36	9.05	39.63	2.28	56.33	73.9	17.5	150	0	
Hori.	12200.000	PK	45.41	39.40	10.39	40.25	2.28	57.23	73.9	16.6	150	0	
Vert.	38.115	QP	35.45	15.38	6.63	32.17	0.00	25.29	40.0	14.7	100	248	
Vert.	48.039	QP	41.78	11.74	6.79	32.16	0.00	28.15	40.0	11.8	100	115	
Vert.	55.870	QP	41.30	9.16	6.73	32.16	0.00	25.03	40.0	14.9	100	111	
Vert.	87.595	QP	43.41	7.62	7.60	32.14	0.00	26.49	40.0	13.5	132	136	
Vert.	120.005	QP	41.96	12.94	7.29	32.12	0.00	30.07	43.5	13.4	100	176	
Vert.	144.177	QP	40.40	14.43	7.72	32.09	0.00	30.46	43.5	13.0	100	250	
Vert.	192.132	QP	38.21	16.27	7.88	32.05	0.00	30.31	43.5	13.1	100	136	
Vert.	250.003	QP	48.79	11.60	8.42	31.99	0.00	36.82	46.0	**9.1**	100	64	
Vert.	267.330	QP	42.11	12.41	8.54	31.98	0.00	31.08	46.0	14.9	100	82	
Vert.	319.927	QP	42.64	13.88	8.90	31.95	0.00	33.47	46.0	12.5	100	323	
Vert.	952.212	QP	29.53	21.54	11.17	30.62	0.00	31.62	46.0	14.3	138	142	
Vert.	3253.303	PK	49.13	29.06	5.60	38.30	2.28	47.77	73.9	26.1	197	120	
Vert.	4880.000	PK	57.97	31.74	6.39	38.55	2.28	59.83	73.9	14.0	180	142	
Vert.	7320.000	PK	44.74	37.42	7.86	39.33	2.28	52.97	73.9	20.9	150	0	
Vert.	9760.000	PK	44.96	39.36	9.05	39.63	2.28	56.02	73.9	17.8	150	0	
Vert.	12200.000	PK	45.15	39.40	10.39	40.25	2.28	56.97	73.9	16.9	150	0	

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

Peak measurement value with DCCF

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3253.303	PK	49.21	29.06	5.60	38.30	-19.05	2.28	28.80	53.9	25.1	*1)
Hori.	4880.000	PK	56.86	31.74	6.39	38.55	-19.05	2.28	39.67	53.9	14.2	
Hori.	7320.000	PK	44.94	37.42	7.86	39.33	-19.05	2.28	34.12	53.9	19.8	
Hori.	9760.000	PK	45.27	39.36	9.05	39.63	-19.05	2.28	37.28	53.9	16.6	
Hori.	12200.000	PK	45.41	39.40	10.39	40.25	-19.05	2.28	38.18	53.9	15.7	
Vert.	3253.303	PK	49.13	29.06	5.60	38.30	-19.05	2.28	28.72	53.9	25.2	*1)
Vert.	4880.000	PK	57.97	31.74	6.39	38.55	-19.05	2.28	40.78	53.9	**13.1**	
Vert.	7320.000	PK	44.74	37.42	7.86	39.33	-19.05	2.28	33.92	53.9	20.0	
Vert.	9760.000	PK	44.96	39.36	9.05	39.63	-19.05	2.28	36.97	53.9	16.9	
Vert.	12200.000	PK	45.15	39.40	10.39	40.25	-19.05	2.28	37.92	53.9	16.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
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
DCCF refer to "Duty cycle correction factor (DCCF)" sheet.
*1) Four-thirds of Carrier frequency

Radiated Spurious Emission

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 27, 2020	February 7, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	23 deg. C / 37 % RH	23 deg. C / 33 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada (30 MHz - 1000 MHz)	Yusuke Tanikawara (1 GHz -13 GHz)	Makoto Hosaka (13 GHz -18 GHz)	Toshinori Yamada (18 GHz -26.5 GHz)
Mode	Tx BT LE 2480 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	87.531	QP	42.45	7.61	7.60	32.14	0.00	25.52	40.0	14.4	221	182	
Hori.	120.061	QP	43.75	12.94	7.29	32.12	0.00	31.86	43.5	11.6	291	32	
Hori.	240.373	QP	47.17	11.32	8.35	32.00	0.00	34.84	46.0	11.1	133	217	
Hori.	249.908	QP	49.12	11.60	8.42	31.99	0.00	37.15	46.0	**8.8**	131	212	
Hori.	259.734	QP	45.58	11.93	8.49	31.98	0.00	34.02	46.0	11.9	138	214	
Hori.	400.012	QP	40.07	15.45	9.26	31.93	0.00	32.85	46.0	13.1	100	202	
Hori.	500.000	QP	36.50	17.48	9.62	31.92	0.00	31.68	46.0	14.3	100	14	
Hori.	816.240	QP	31.34	20.42	10.76	31.55	0.00	30.97	46.0	15.0	108	154	
Hori.	952.349	QP	33.73	21.54	11.17	30.62	0.00	35.82	46.0	10.1	100	234	
Hori.	2483.500	PK	44.65	28.35	14.10	38.62	2.28	50.76	73.9	23.1	142	54	
Hori.	3306.644	PK	47.81	28.84	5.60	38.27	2.28	46.26	73.9	27.6	222	211	
Hori.	4960.000	PK	52.95	31.99	6.44	38.55	2.28	55.11	73.9	18.7	145	182	
Hori.	7440.000	PK	44.99	37.58	7.94	39.51	2.28	53.28	73.9	20.6	150	0	
Hori.	9920.000	PK	45.03	39.47	9.14	39.51	2.28	56.41	73.9	17.4	150	0	
Hori.	12400.000	PK	45.12	38.78	10.52	40.02	2.28	56.68	73.9	17.2	150	0	
Vert.	38.583	QP	35.23	15.20	6.63	32.17	0.00	24.89	40.0	15.1	100	247	
Vert.	48.034	QP	41.70	11.74	6.79	32.16	0.00	28.07	40.0	11.9	100	113	
Vert.	53.837	QP	41.39	9.78	6.77	32.16	0.00	25.78	40.0	14.2	100	110	
Vert.	87.804	QP	43.87	7.66	7.59	32.14	0.00	26.98	40.0	13.0	125	134	
Vert.	120.061	QP	40.98	12.94	7.29	32.12	0.00	29.09	43.5	14.4	100	176	
Vert.	144.033	QP	40.25	14.41	7.72	32.09	0.00	30.29	43.5	13.2	100	236	
Vert.	192.117	QP	38.10	16.27	7.88	32.05	0.00	30.20	43.5	13.3	100	145	
Vert.	250.006	QP	48.69	11.60	8.42	31.99	0.00	36.72	46.0	9.2	100	67	
Vert.	267.292	QP	42.25	12.40	8.54	31.98	0.00	31.21	46.0	14.7	100	91	
Vert.	319.238	QP	42.72	13.85	8.89	31.95	0.00	33.51	46.0	12.4	100	327	
Vert.	952.349	QP	29.94	21.54	11.17	30.62	0.00	32.03	46.0	13.9	134	138	
Vert.	2483.500	PK	44.40	28.35	14.10	38.62	2.28	50.51	73.9	23.3	157	90	
Vert.	3306.644	PK	47.91	28.84	5.60	38.27	2.28	46.36	73.9	27.5	149	85	
Vert.	4960.000	PK	54.12	31.99	6.44	38.55	2.28	56.28	73.9	17.6	105	139	
Vert.	7440.000	PK	45.12	37.58	7.94	39.51	2.28	53.41	73.9	20.4	150	0	
Vert.	9920.000	PK	45.65	39.47	9.14	39.51	2.28	57.03	73.9	16.8	150	0	
Vert.	12400.000	PK	45.25	38.78	10.52	40.02	2.28	56.81	73.9	17.0	150	0	

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

Peak measurement value with DCCF

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	44.65	28.35	14.10	38.62	-19.05	2.28	31.71	53.9	22.2	*1)
Hori.	3306.644	PK	47.81	28.84	5.60	38.27	-19.05	2.28	27.21	53.9	26.7	*2)
Hori.	4960.000	PK	52.95	31.99	6.44	38.55	-19.05	2.28	36.06	53.9	17.8	
Hori.	7440.000	PK	44.99	37.58	7.94	39.51	-19.05	2.28	34.23	53.9	19.7	
Hori.	9920.000	PK	45.03	39.47	9.14	39.51	-19.05	2.28	37.36	53.9	16.5	
Hori.	12400.000	PK	45.12	38.78	10.52	40.02	-19.05	2.28	37.63	53.9	16.3	
Vert.	2483.500	PK	44.40	28.35	14.10	38.62	-19.05	2.28	31.46	53.9	22.4	*1)
Vert.	3306.644	PK	47.91	28.84	5.60	38.27	-19.05	2.28	27.31	53.9	26.6	*2)
Vert.	4960.000	PK	54.12	31.99	6.44	38.55	-19.05	2.28	37.23	53.9	16.7	
Vert.	7440.000	PK	45.12	37.58	7.94	39.51	-19.05	2.28	34.36	53.9	19.5	
Vert.	9920.000	PK	45.65	39.47	9.14	39.51	-19.05	2.28	37.98	53.9	**15.9**	
Vert.	12400.000	PK	45.25	38.78	10.52	40.02	-19.05	2.28	37.76	53.9	16.1	

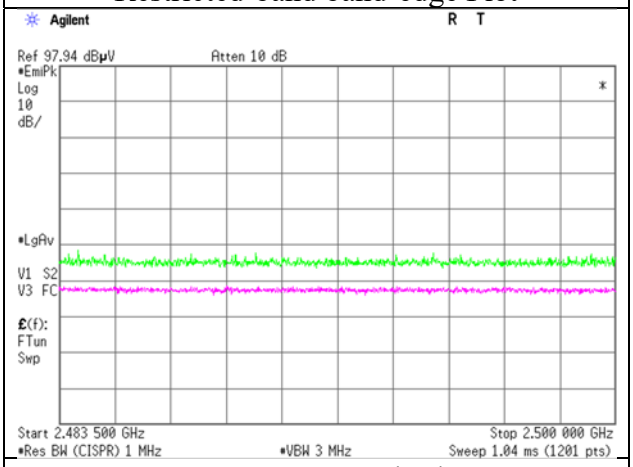
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + DCCF + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
DCCF refer to "Duty cycle correction factor (DCCF)" sheet.
*1) Not out of band emission (Leakage Power)
*2) Four-thirds of Carrier frequency

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13211388S-D
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 7, 2020
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Yusuke Tanikawara
Mode	Tx BT LE 2480 MHz

Horizontal

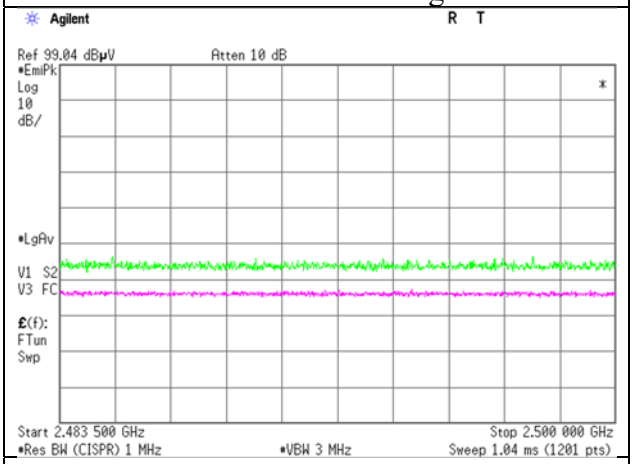
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

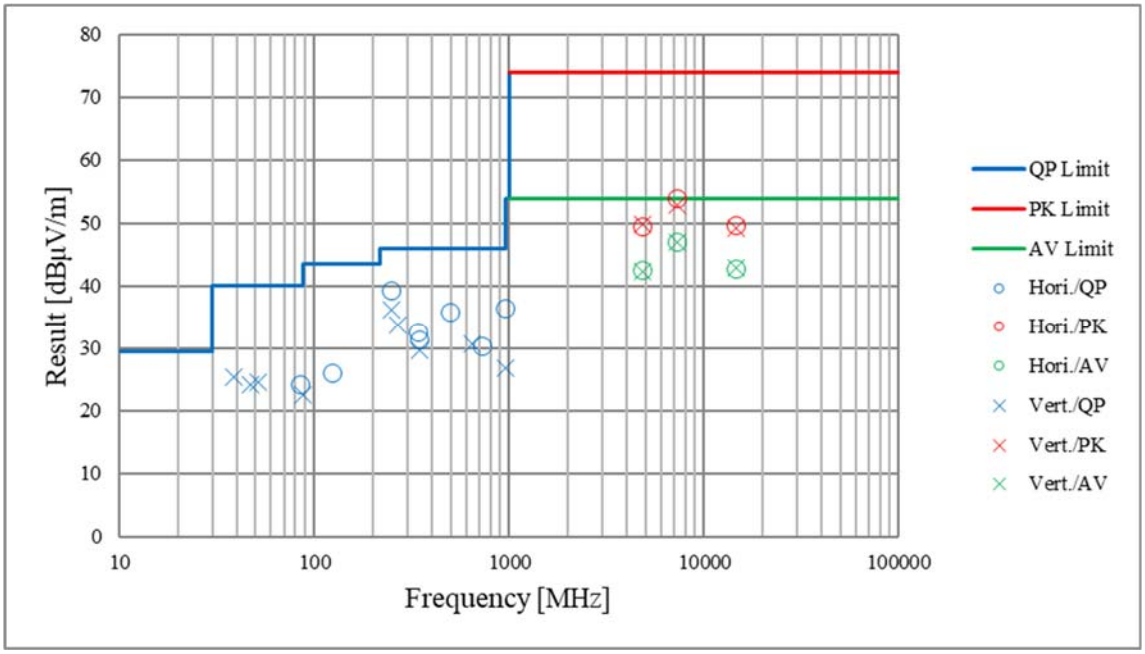


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

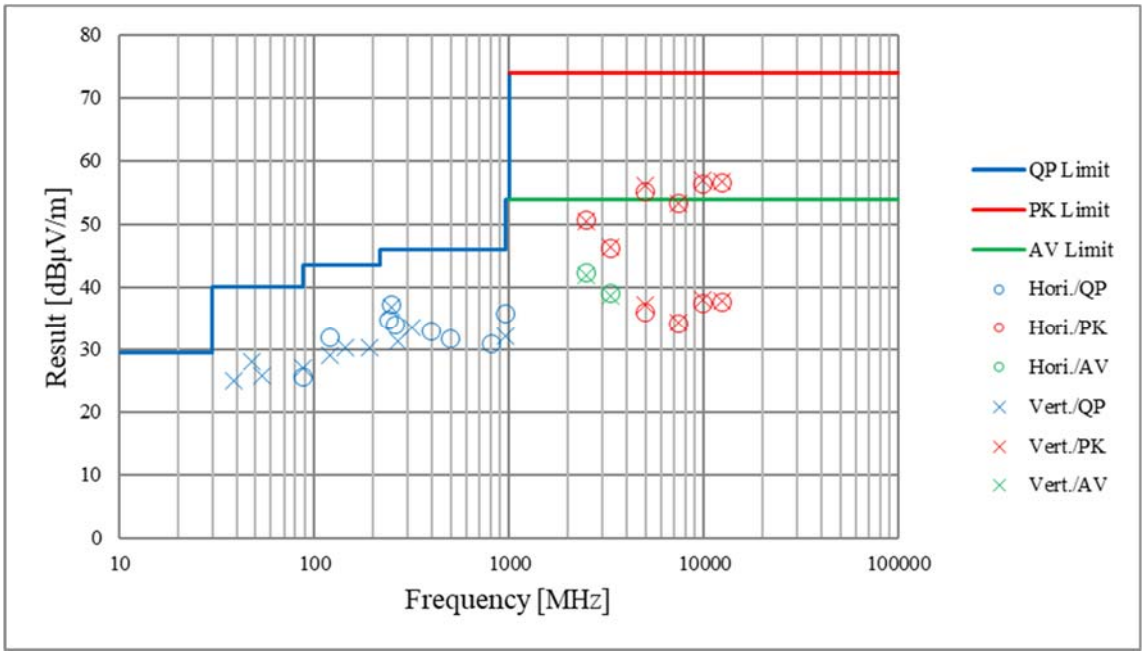
Report No.	13211388S-D				
Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	No.3	No.3	No.2	No.3	No.3
Date	February 27, 2020	February 12, 2020	February 11, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	23 deg. C / 37 % RH	22 deg. C / 35 % RH	21 deg. C / 38 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka	Toshinori Yamada
	(30 MHz - 1000 MHz)	(1 GHz -2.8 GHz)	(2.8 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx OFDM VHT 20 2437 MHz MIMO				



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13211388S-D			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.3	No.3
Date	February 27, 2020	February 7, 2020	February 14, 2020	February 25, 2020
Temperature / Humidity	23 deg. C / 37 % RH	23 deg. C / 33 % RH	22 deg. C / 40 % RH	23 deg. C / 45 % RH
Engineer	Toshinori Yamada	Yusuke Tanikawara	Makoto Hosaka	Toshinori Yamada
	(30 MHz - 1000 MHz)	(1 GHz -13 GHz)	(13 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx BT LE 2480 MHz			



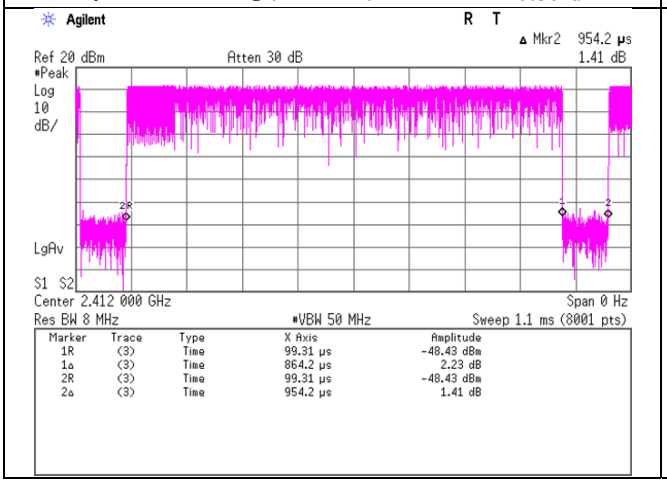
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Burst rate confirmation

Report No.	13211388S-D
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

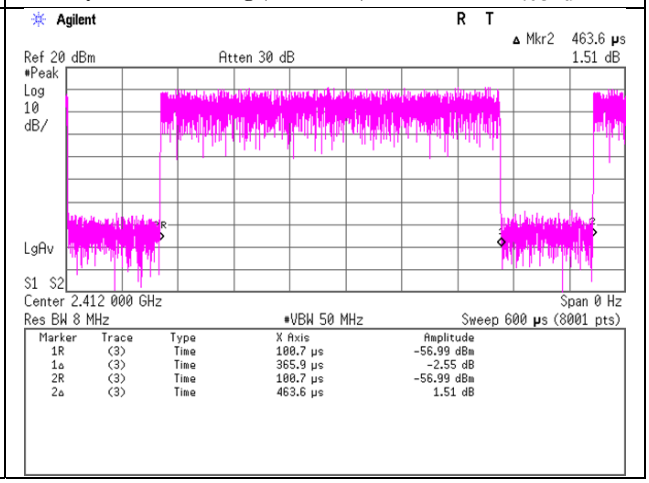
11b, 11 Mbps

Tx on / (Tx on + Tx off) =	0.906
Tx on / (Tx on + Tx off) * 100 =	90.6 %
Duty factor = 20 * log (0.95 / 0.86) =	0.86 dB



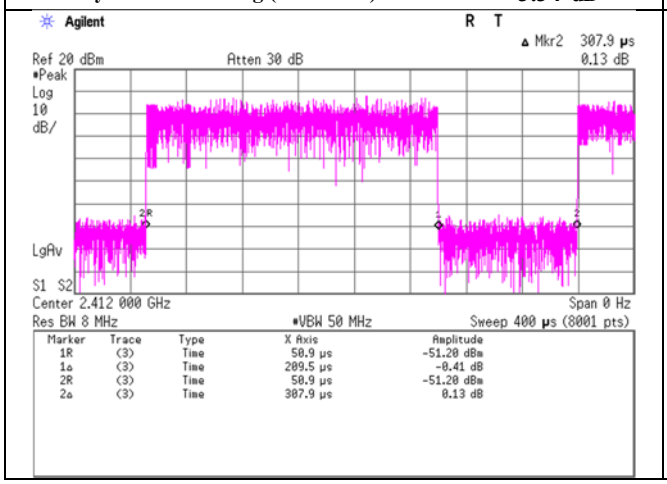
11n-20, SISO, MCS 3

Tx on / (Tx on + Tx off) =	0.791
Tx on / (Tx on + Tx off) * 100 =	79.1 %
Duty factor = 20 * log (0.46 / 0.37) =	2.03 dB



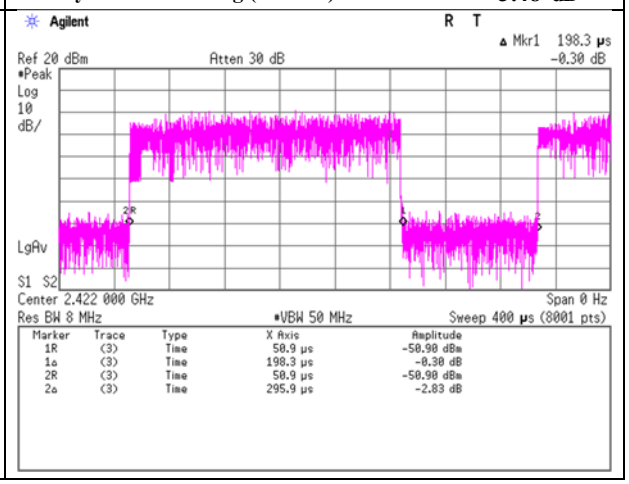
OFDM VHT20, MIMO, MCS 3

Tx on / (Tx on + Tx off) =	0.680
Tx on / (Tx on + Tx off) * 100 =	68.0 %
Duty factor = 20 * log (0.31 / 0.21) =	3.34 dB



11n-40, SISO, MCS 3

Tx on / (Tx on + Tx off) =	0.670
Tx on / (Tx on + Tx off) * 100 =	67.0 %
Duty factor = 20 * log (0.3 / 0.2) =	3.48 dB



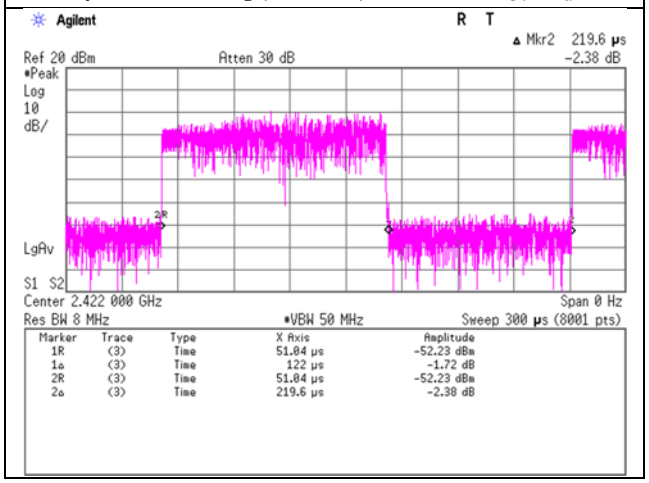
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Report No.	13211388S-D
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

11n-40, MIMO, MCS 11

Tx on / (Tx on + Tx off) =	**0.556**
Tx on / (Tx on + Tx off) * 100 =	**55.6 %**
Duty factor = 20 * log (0.22 / 0.12) =	**5.12 dB**



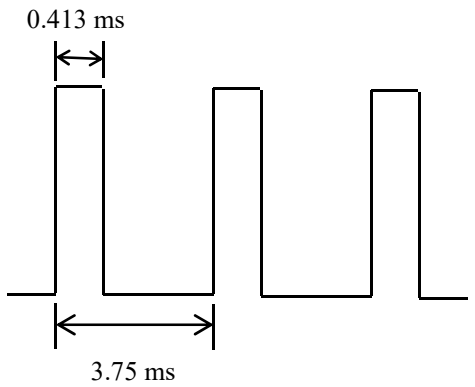
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Duty cycle correction factor (DCCF)

Report No.	13211388S-D
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 BT LE

Worst 100ms

Duty cycle correction factor (DCCF) = 20log(27×0.413/100) = -19.05 dB



*Worst TX Duty cycle BLE is Advertising mode which max on time is 0.413 ms and Min interval is 3.75 ms (Refer to BLE Worst TX Duty sheet).
The actual measurement value was applied as Averaging factor (Duty Factor).

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	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-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-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	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	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2019/08/08	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 test