



RADIO TEST REPORT

Test Report No. : 12656071S-R-R1

Applicant : Nintendo Co., Ltd.
Type of Equipment : Game Console
Model No. : HDH-002
FCC ID : BKEHDH002
Test regulation : **FCC Part 15 Subpart C: 2019**
* Bluetooth BDR/EDR part
Test Result : **Complied (Refer to SECTION 3.2)**
Test Item : **Maximum Peak Output Power,
Spurious Emission(1 GHz to 13 GHz),
Restricted Band Edges**
Purpose of test : **Spot check**

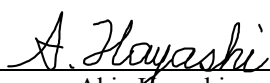
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 12656071S-R. 12656071S-R is replaced with this report.

Date of test: April 5 to August 4, 2019

Representative test engineer:


Kazutaka Takayama
Engineer
Consumer Technology Division

Approved by:


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".

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Shonan EMC Lab.

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REVISION HISTORY

Original Test Report No.: 12656071S-R

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12656071S-R	August 6, 2019	-	-
1	12656071S-R-R1	September 27, 2019	5	Addition of product description as below, The EUT is intended to be used for software development or events.

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Antenna Terminal Conducted Tests.....	11
SECTION 6: Radiated Spurious Emission	12
APPENDIX 1: Test data	14
Maximum Peak Conducted Output Power.....	14
Radiated Spurious Emission	15
APPENDIX 2: Test instruments	23
APPENDIX 3: Photographs of test setup	25
Radiated Spurious Emission	25

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 Equipment, Model No., 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 (E.U.T.)
 - SECTION 4: Operation of E.U.T. 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 (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Game Console
Model No.	:	HDH-002
Serial No.	:	Refer to Section 4.2
Rating	:	DC 3.8 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.)	:	December 27, 2018
Country of Mass-production	:	China
Condition of EUT	:	Engineering 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: HDH-002 (referred to as the EUT in this report) is a Game Console.
The EUT is intended to be used for software development or events.

Radio Specification

Wireless LAN, Bluetooth part:

Equipment type	: Transmitter
Frequency of operation	: Wireless LAN part: (2.4 GHz): 2412 MHz - 2472 MHz, (U-NII-1): 5180 MHz - 5240 MHz, (U-NII-2A): 5260 MHz - 5320 MHz, Bluetooth (BDR/EDR/BTLE) part: 2402 MHz - 2480 MHz
Radio part clock frequency	: 37.4 MHz
Channel spacing	: Wireless LAN part: (2.4 GHz): 5 MHz, (5 GHz): 20 MHz, Bluetooth part: (BDR/EDR): 1 MHz, (BT LE): 2 MHz
Type of modulation	: Wireless LAN part: 2.4 GHz bands: DBPSK, DQPSK, CCK, OFDM, 5 GHz bands: OFDM Bluetooth (BT) part: BDR (Basic Data Rate): GFSK, EDR (Enhanced Data Rate): $\pi/4$ -DQPSK, 8DPSK, BT LE (Low Energy mode): GFSK
Antenna type	: Sheet metal antenna
Antenna connector type	: (Ant: 0): MHF2, (Ant: 1): MHF2
Antenna gain	: 2.4 GHz bands: (Ant: 0): -0.904 dBi, (Ant: 1): -0.730 dBi 5 GHz bands: (Ant: 0): 2.949 dBi, (Ant: 1): 1.994 dBi
Power Supply (radio part input)	: DC 1.8 V, DC 3.3 V
Operation temperature range	: +5 deg.C to +35 deg.C

Remarks: This wireless module consists of 1 chip each of 5 GHz bands and 2.4 GHz bands.

NFC part:

Equipment type	: Transmitter
Frequency of operation	: 13.56 MHz
Radio part clock frequency	: 27.12 MHz
Type of modulation	: ASK
Power Supply (radio part input)	: DC 1.8 V, DC 5.0 V
Antenna type	: Ferrite Chip Antenna
Operation temperature range	: +5 deg.C to +35 deg.C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
 FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
 Section 15.207 Conducted limits
 Section 15.247 Operation within the bands 902-928MHz,
 2400-2483.5MHz, and 5725-5850MHz

* The revisions made after testing date do not affect the test specification applied to the EUT.

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (b)	See data.	Complied a)	Conducted
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r01 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.3 dB 4804.00 MHz, Average, Horizontal, Mode: Tx 2402 MHz, BDR	Complied# b)	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. a) Refer to APPENDIX 1 (data of Maximum Peak Output Power) b) Refer to APPENDIX 1 (data of Radiated Spurious Emission)					
Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

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

FCC Part 15.31 (e)

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

FCC Part 15.203 Antenna requirement

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

3.3 Addition to standard

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

3.4 Uncertainty

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

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

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.9 dB	2.8 dB	2.9 dB	2.9 dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.7 dB	-	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.8 dB	4.8 dB	4.8 dB	-	-
	6 GHz-18 GHz	5.4 dB	5.4 dB	5.4 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 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	0.81 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.53 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.95 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.21 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.90 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.04 dB

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

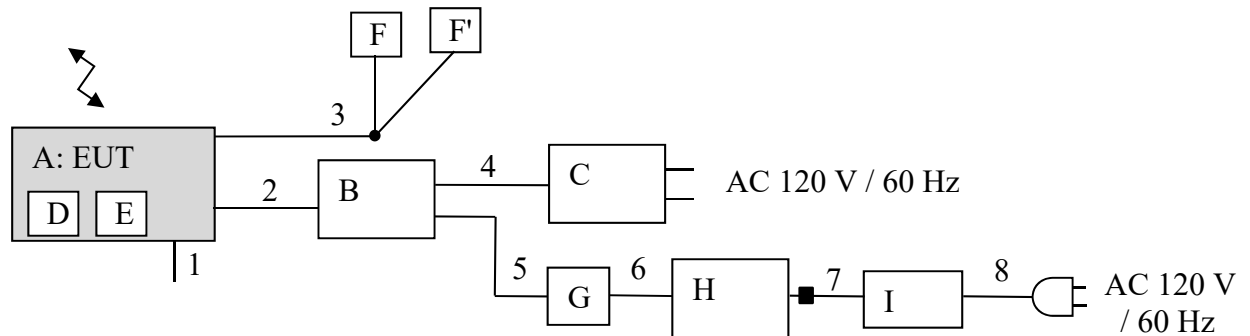
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Spurious Emission (Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2480 MHz
Band Edge Compliance (Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length. *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: Fixed Software: cmd.exe version 6.1.7601.23403 BlueTool.exe ver.1.9.2.4 *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.		

4.2 Configuration and peripherals



■: Standard Ferrite Core

* 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	Game Console	HDH-002	XJW01000026236 *1) XJW01000026052 *2)	Nintendo Co., Ltd.	EUT
B	SDEV Cradle	HAT-003	XZL0100007151	Nintendo Co., Ltd.	-
C	AC Adapter	HAC-002		Nintendo Co., Ltd.	-
D	Game Card	HAC-008	DFCAA22L000	Nintendo Co., Ltd.	-
E	Micro SD Card	-	-	Transcend	-
F, F'	Headphone	-	-	Nintendo Co., Ltd.	-
G	GIGA Ethernet Adapter	LAN-GTJU3	3495DB2BF5CA	Logitec	-
H	Laptop PC	CF-S10AWNDS	2BKSA58270	Panasonic	-
I	AC Adapter	CF-AA6402A M1	6402AM111Z03016A	Panasonic	-

*1) Used for Maximum Peak Output Power

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

List of cables used

No.	Cable Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	0.1	Unshielded	Unshielded	*3)
2	USB	0.4	Shielded	Shielded	-
3	Headphone	0.5 + 0.3	Unshielded	Unshielded	-
4	USB	1.8	Shielded	Shielded	-
5	USB	0.15	Shielded	Shielded	-
6	LAN	0.5	Unshielded	Unshielded	-
7	DC	1.8	Unshielded	Unshielded	-
8	AC	1.0	Unshielded	Unshielded	-

*3) This signal cable is used only for the settings of the bluetooth test mode, not used for the product.

SECTION 5: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
Maximum Peak Output Power	-	-	-	Auto	Peak Average *1)	-	Power Meter (Sensor: 160 MHz BW)
*1) Reference data							

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

Test data : APPENDIX

Test result : Pass

SECTION 6: Radiated Spurious Emission

Test Procedure

[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.

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 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	Above 1 GHz
Antenna Type	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.

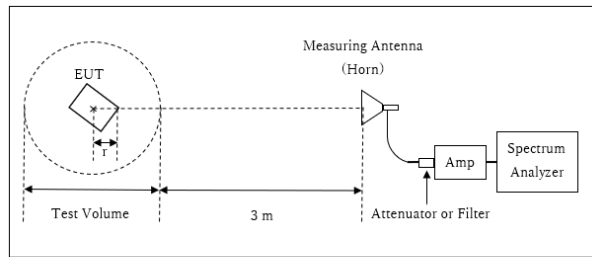
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Above 1 GHz		20 dBc
Instrument used	Spectrum Analyzer		Spectrum Analyzer
Detector	PK	AV *1)	PK
IF Bandwidth	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r01.

Figure 1: Test Setup

1 GHz - 13 GHz



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

Distance Factor: $20 \times \log (3.89 \text{ m} / 3.0 \text{ m}) = 2.26\text{dB}$
 * Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.89 \text{ m}$

Test Volume : 2.0 m
 (Test Volume has been calibrated based on CISPR 16-1-4.)
 r = 0.11 m

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

Antenna polarization	Spurious 1 GHz - 2.8 GHz	Spurious 2.8 GHz - 13 GHz
Horizontal	X	X
Vertical	Z	X

*The worst condition was determined based on the test result of HDH-001 (12656071S-H).

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

Measurement range : 1 GHz - 13 GHz
Test data : APPENDIX
Test result : Pass

Radiated Emission

Report No.
 Test place Shonan EMC Lab.
 Semi Anechoic Chamber No.3
 Date April 5, 2019
 Temperature / Humidity 20 deg.C / 45 %RH
 Engineer Kazutaka Takeyama
 (1 GHz - 13 GHz)
 Mode Tx, 2402 MHz
 Tx, Bluetooth, BDR, PRBS9,

(* 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	47.10	27.86	14.15	41.59	2.26	49.78	73.90	24.1	169	263	
Hori.	4804.000	PK	58.40	31.43	6.45	42.88	2.26	55.66	73.90	18.2	138	333	
Hori.	2390.000	AV	36.10	27.86	14.15	41.59	2.26	38.78	53.90	15.1	169	263	VBW: 360 Hz
Hori.	4804.000	AV	53.30	31.43	6.45	42.88	2.26	50.56	53.90	3.3	138	333	VBW: 360 Hz
Vert.	2390.000	PK	47.00	27.86	14.15	41.59	2.26	49.68	73.90	24.2	148	240	
Vert.	4804.000	PK	55.90	31.43	6.45	42.88	2.26	53.16	73.90	20.7	203	48	
Vert.	2390.000	AV	36.30	27.86	14.15	41.59	2.26	38.98	53.90	14.9	148	240	VBW: 360 Hz
Vert.	4804.000	AV	52.30	31.43	6.45	42.88	2.26	49.56	53.90	4.3	203	48	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$ 13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

* These results have sufficient margin without taking account Dwell time factor.

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

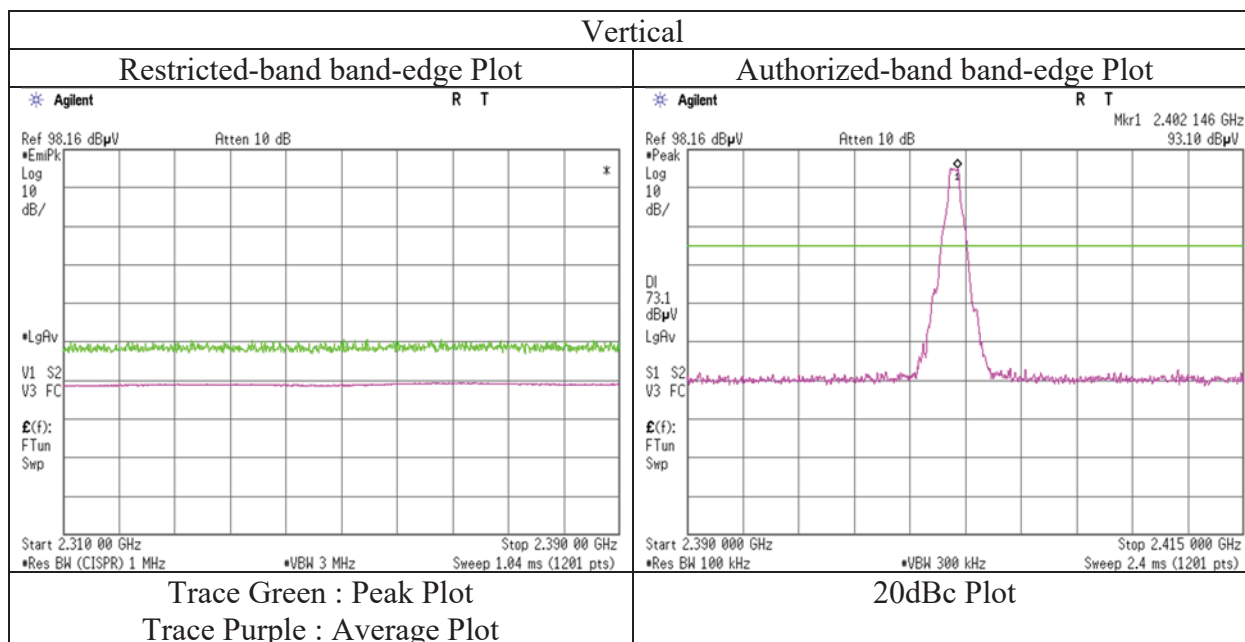
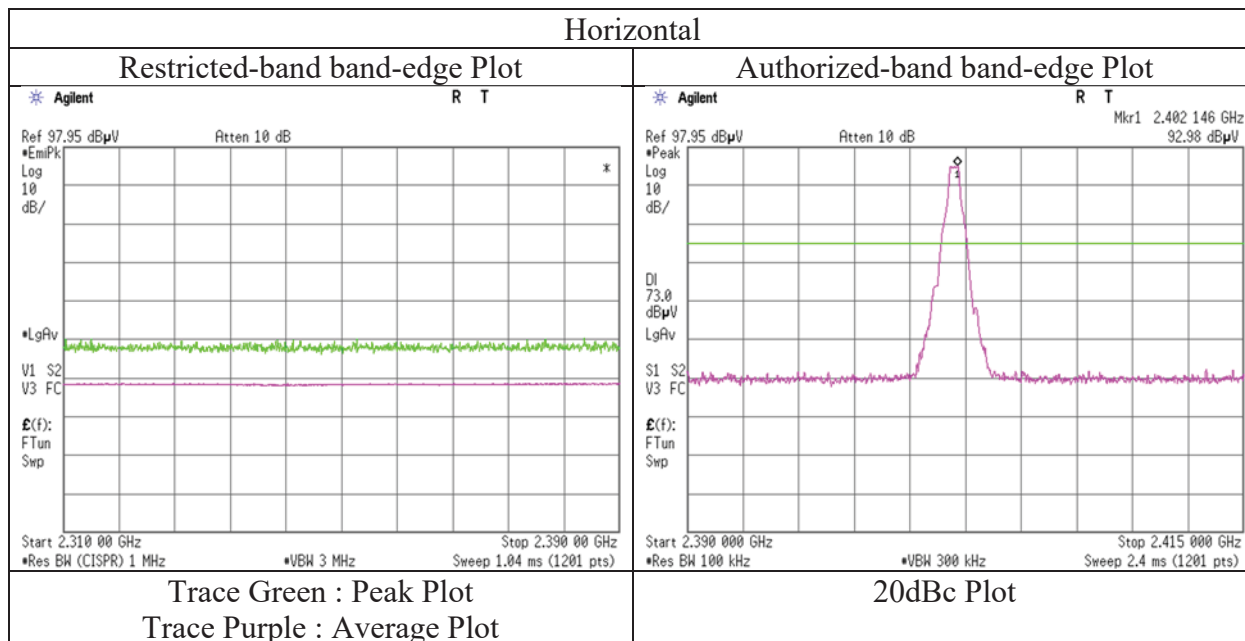
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	93.40	27.86	14.16	41.60	2.26	96.08	-	-	Carrier
Hori.	2400.000	PK	39.30	27.86	14.16	41.60	2.26	41.98	76.08	34.1	
Vert.	2402.000	PK	93.20	27.86	14.16	41.60	2.26	95.88	-	-	Carrier
Vert.	2400.000	PK	39.40	27.86	14.16	41.60	2.26	42.08	75.88	33.8	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$ 13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 5, 2019
Temperature / Humidity	20 deg.C / 45 %RH
Engineer	Kazutaka Takeyama
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, DH5 , 2402 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

Final result of restricted band edge was shown in tabular data.

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Radiated Emission

Report No.
 Test place Shonan EMC Lab.
 Semi Anechoic Chamber No.3
 Date April 5, 2019
 Temperature / Humidity 20 deg.C / 45 %RH
 Engineer Kazutaka Takeyama
 (1 GHz - 13 GHz)
 Mode Tx, 2480 MHz
 Tx, Bluetooth, BDR, PRBS9,

(* 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	47.40	27.65	14.22	41.62	2.26	49.91	73.90	23.9	103	258	
Hori.	2483.500	AV	36.30	27.65	14.22	41.62	2.26	38.81	53.90	15.0	103	258	VBW: 360 Hz
Vert.	2483.500	PK	47.60	27.65	14.22	41.62	2.26	50.11	73.90	23.7	100	258	
Vert.	2483.500	AV	36.60	27.65	14.22	41.62	2.26	39.11	53.90	14.7	100	258	VBW: 360 Hz

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

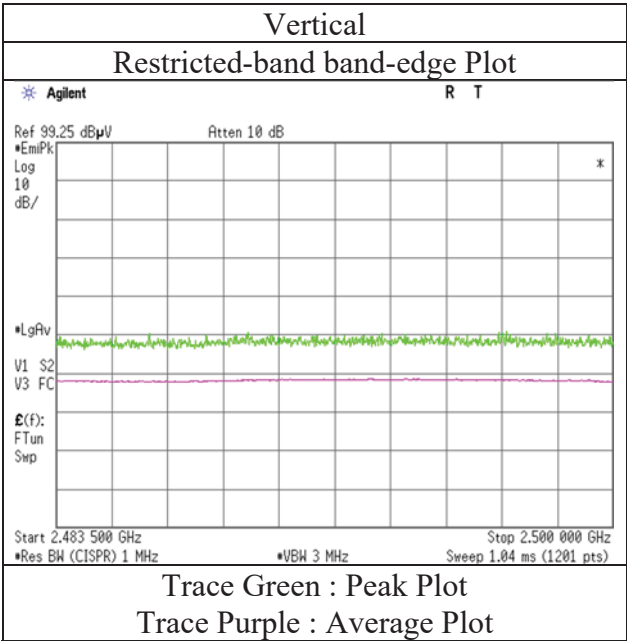
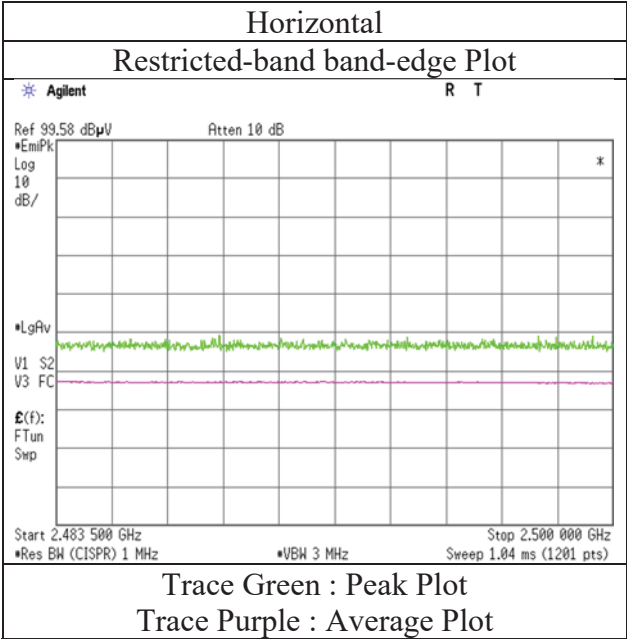
Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$

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

* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 5, 2019
Temperature / Humidity	20 deg.C / 45 %RH
Engineer	Kazutaka Takeyama
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, DH5 , 2480 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

Final result of restricted band edge was shown in tabular data.

Radiated Emission

Report No.
 Test place Shonan EMC Lab.
 Semi Anechoic Chamber No.3
 Date April 5, 2019
 Temperature / Humidity 20 deg.C / 45 %RH
 Engineer Kazutaka Takeyama
 (1 GHz - 13 GHz)
 Mode Tx, 2402 MHz
 Tx, Bluetooth, EDR, PRBS9,

(* 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	46.80	27.86	14.15	41.59	2.26	49.48	73.90	24.4	123	252	
Hori.	4804.000	PK	59.90	31.43	6.45	42.88	2.26	57.16	73.90	16.7	150	334	
Hori.	2390.000	AV	36.00	27.86	14.15	41.59	2.26	38.68	53.90	15.2	123	252	VBW: 360 Hz
Hori.	4804.000	AV	52.60	31.43	6.45	42.88	2.26	49.86	53.90	4.0	150	334	VBW: 360 Hz
Vert.	2390.000	PK	47.20	27.86	14.15	41.59	2.26	49.88	73.90	24.0	145	209	
Vert.	4804.000	PK	57.00	31.43	6.45	42.88	2.26	54.26	73.90	19.6	215	51	
Vert.	2390.000	AV	36.20	27.86	14.15	41.59	2.26	38.88	53.90	15.0	145	209	VBW: 360 Hz
Vert.	4804.000	AV	49.30	31.43	6.45	42.88	2.26	46.56	53.90	7.3	215	51	VBW: 360 Hz

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$ 13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

* These results have sufficient margin without taking account Dwell time factor.

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

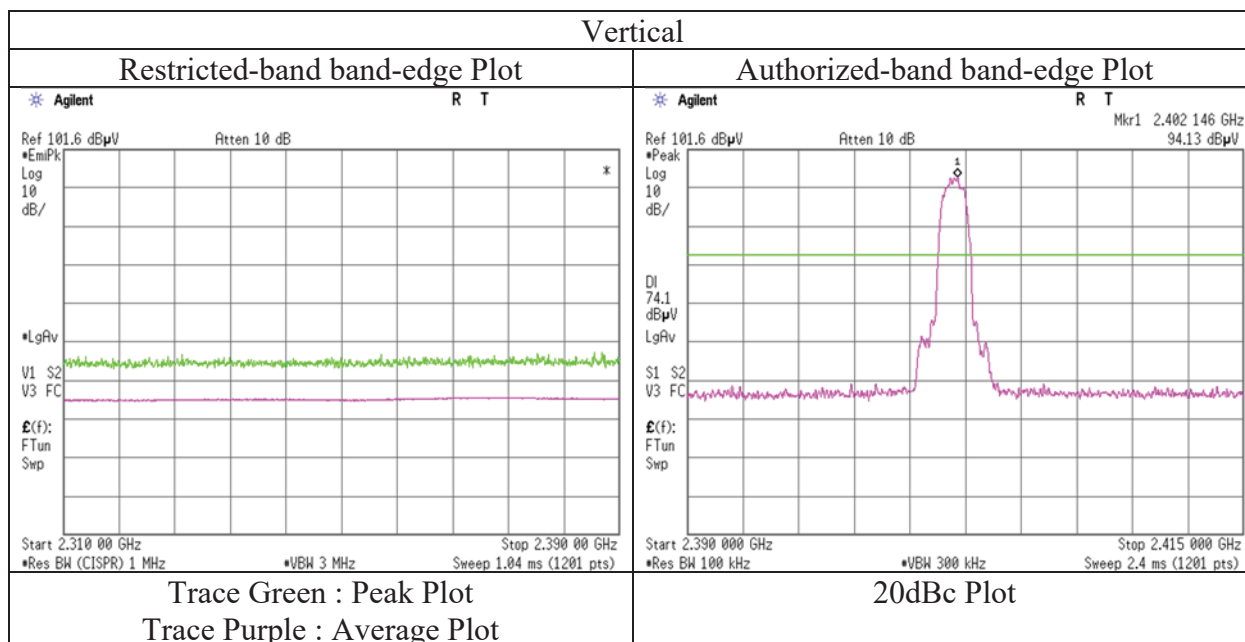
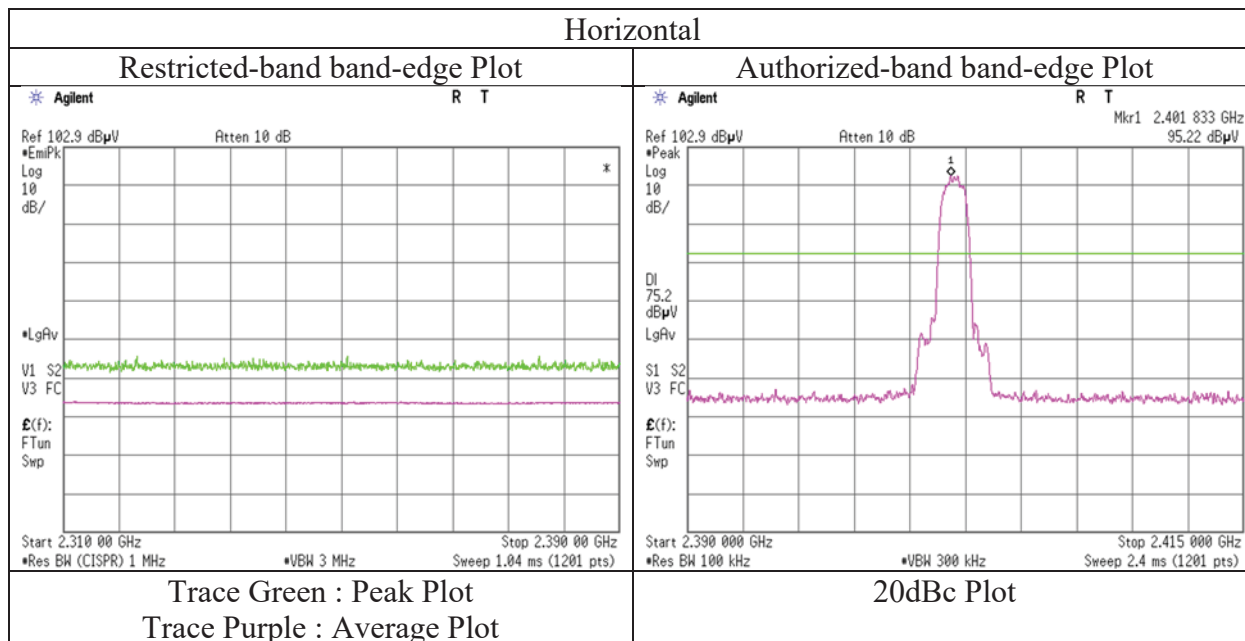
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	95.00	27.86	14.16	41.60	2.26	97.68	-	-	Carrier
Hori.	2400.000	PK	40.00	27.86	14.16	41.60	2.26	42.68	77.68	35.0	
Vert.	2402.000	PK	94.00	27.86	14.16	41.60	2.26	96.68	-	-	Carrier
Vert.	2400.000	PK	40.00	27.86	14.16	41.60	2.26	42.68	76.68	34.0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$ 13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 5, 2019
Temperature / Humidity	20 deg.C / 45 %RH
Engineer	Kazutaka Takeyama
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 , 2402 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

Final result of restricted band edge was shown in tabular data.

UL Japan, Inc.

Shonan EMC Lab.

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Radiated Emission

Report No.
 Test place Shonan EMC Lab.
 Semi Anechoic Chamber No.3
 Date April 5, 2019
 Temperature / Humidity 20 deg.C / 45 %RH
 Engineer Kazutaka Takeyama
 (1 GHz - 13 GHz)
 Mode Tx, 2480 MHz
 Tx, Bluetooth, EDR, PRBS9,

(* 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	48.80	27.65	14.22	41.62	2.26	51.31	73.90	22.5	111	251	
Hori.	2483.500	AV	36.30	27.65	14.22	41.62	2.26	38.81	53.90	15.0	111	251	VBW: 360 Hz
Vert.	2480.050	PK	47.90	27.67	14.22	41.62	2.26	50.43	73.90	23.4	100	259	
Vert.	2480.050	AV	36.70	27.67	14.22	41.62	2.26	39.23	53.90	14.6	100	259	VBW: 360 Hz

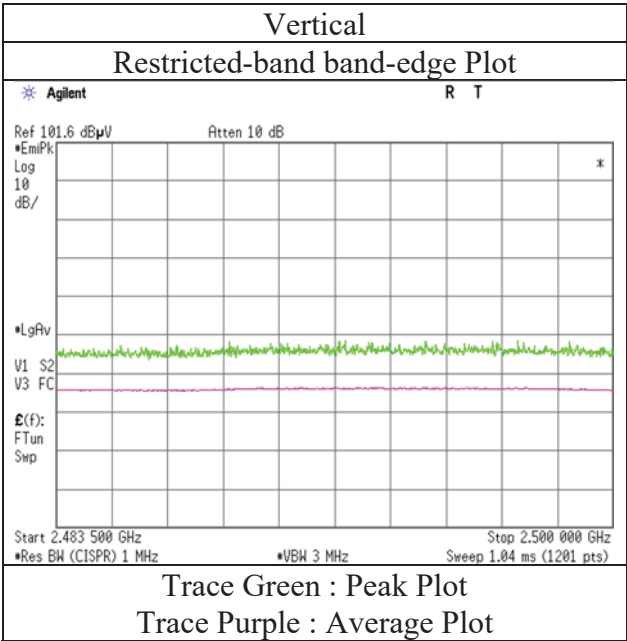
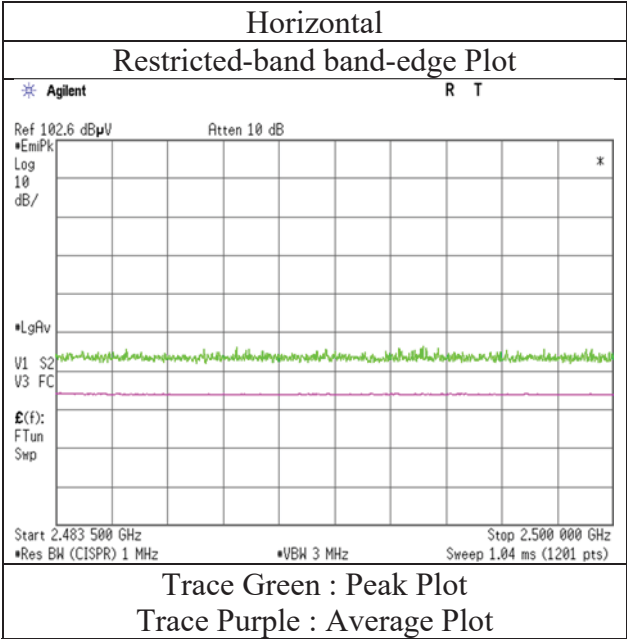
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.89\text{ m} / 3.0\text{ m}) = 2.26\text{ dB}$ 13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

* These results have sufficient margin without taking account Dwell time factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	April 5, 2019
Temperature / Humidity	20 deg.C / 45 %RH
Engineer	Kazutaka Takeyama
	(1 GHz – 2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 , 2480 MHz



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

APPENDIX 2

Test Instruments

EMI test equipment

Local ID	Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Calibration Interval (Month)
SAT10-16	AT	160494	Attenuator	Weinschel Corp.	54A-10	83406	2018/12/6	2019/12/30	12
SCC-G13	AT	145166	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	2018/12/25	2019/12/31	12
SOS-06	AT	146294	Humidity Indicator	A&D	AD-5681	4062118	2018/12/5	2019/12/31	12
SPM-06	AT	146267	Power Meter	ANRITSU	ML2495A	850009	2019/5/22	2020/5/31	12
SPSS-03	AT	146309	Power sensor	ANRITSU	MA2411B	917063	2019/5/22	2020/5/31	12
SSA-02	AT	145800	Spectrum Analyzer	AGILENT	E4448A	MY48250106	2019/4/4	2020/4/31	12
STM-G7	AT	171614	Terminator	Weinschel - API Technologies Corp	M1459A	88995	2019/7/4	2020/7/31	12
STS-03	AT	146210	Digital Hitester	HIOKI	3805-50	80997823	2018/10/16	2019/10/31	12

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:

AT: Antenna terminal conducted test

EMI test equipment

Local ID	Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Calibration Interval (Month)
KJM-09	RE	145929	Measure	KOMELON	KMC-36	-	-	-	-
KSA-08	RE	145089	Spectrum Analyzer	AGILENT	E4446A	MY46180525	2018/10/7	2019/10/31	12
SAEC-03(SVSWR)	RE	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2018/7/17	2019/7/31	12
SAF-04	RE	145127	Pre Amplifier	Toyo Corporation	TPA0118-36	2072554	2018/6/26	2019/6/30	12
SAF-06	RE	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2019/2/8	2020/2/29	12
SAT10-05	RE	145136	Attenuator(above 1 GHz)	AGILENT	8493C-010	74864	2018/11/25	2019/11/30	12
SCC-G40	RE	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2019/1/25	2020/1/31	12
SCC-G43	RE	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	SN MY 13406/4E	2018/7/10	2019/7/31	12
SCC-G44	RE	168300	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800070/4A	2019/3/26	2020/3/31	12
SHA-03	RE	145501	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	2018/7/23	2019/7/31	12
SOS-05	RE	146293	Humidity Indicator	A&D	AD-5681	4062518	2018/10/25	2019/10/31	12
STS-01	RE	145792	Digital Hitester	HIOKI	3805-50	80997812	2018/10/16	2019/10/31	12

*Hyphens for Last Calibration Date, Calibration Due 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