RADIO TEST REPORT

Test Report No. : 12309349S-A-R3

Applicant	:	**Nintendo Co., Ltd.**
Type of Equipment	:	**Wireless Control Device**
Model No.	:	**HAC-024**
FCC ID	:	**BKEM**
Test regulation	:	**FCC Part 15 Subpart C: 2018**
Test Result	:	**Complied**

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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 EMC technical requirements.
It does not cover administrative issues such as Manual or non-EMC 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. This report is a revised version of 12309349S-A-R2. 12309349S-A-R2 is replaced with this report.

Date of test: May 5 to 16, 2018

Representative test engineer:
Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by:
Akio Hayashi
Leader
Consumer Technology Division

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

RTL02610

UL Japan, Inc.
Shonan EMC Lab.
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REVISION HISTORY

Original Test Report No.: 12309349S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12309349S-A	May 28, 2018	-	-
1	12309349S-A-R1	June 22, 2018	9	Correction of remarks *1) and *2)
2	12309349S-A-R2	July 2, 2018	29	Correction of Freq. value: from 2412.00 to 2402.00 from 2437.00 to 2440.00 from 2462.00 to 2480.00
3	12309349S-A-R3	July 6, 2018	9	Update of Item B: from Cradle to Switch dock

CONTENTS **PAGE**

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	:	Shigenobu Kinoshita

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless Control Device
Model No.	:	HAC-024
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5 V (USB) DC 3.7 V (Battery)
Receipt Date of Sample	:	April 23, 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: HAC-024 (referred to as the EUT in this report) is a Wireless Control Device.

Radio Specification

Equipment Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Type of Modulation	:	GFSK
Power Supply (inner)	:	DC 1.8 V
Antenna Type	:	Inverted-F
Antenna Gain	:	-0.94 dBi
Operating Temperature	:	0 deg. C to +40 deg. C
Clock frequency (Maximum)	:	96 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018
Title	:	FCC 47CFR Part15 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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods **IC:** RSS-Gen 8.8	**FCC:** Section 15.207 **IC:** RSS-Gen 8.8	25.0 dB 0.16100 MHz, L1, QP Tx BT LE 2480 MHz	Complied	-
6dB Bandwidth	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** -	**FCC:** Section 15.247(a)(2) **IC:** RSS-247 5.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** RSS-Gen 6.12	**FCC:** Section 15.247(b)(3) **IC:** RSS-247 5.4(d)		Complied	Conducted
Power Density	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** -	**FCC:** Section 15.247(e) **IC:** RSS-247 5.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.8 dB 7440.000 MHz, AV, Vert. Tx BT LE 2480 MHz	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
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 DTS Meas Guidance v04 12.2.7.					

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

FCC Part 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC 1.8 V).
Therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**IC:** RSS-Gen 6.6	**IC:** -	N/A	-	Conducted

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

3.4 Uncertainty

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	2.5 dB	2.5 dB	2.5 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.9 dB	4.8 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 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	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test

The data listed in this test report has enough margin, more than the site margin.

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
JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

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

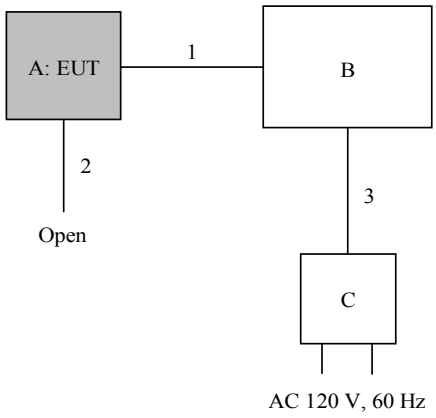
4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth Low Energy (BT LE)	PRBS9
*Power of the EUT was set by the software as follows; Power settings: Fixed Software: 180202_PeripheralControl_997fce (HAC-024) *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.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission Spurious Emission 6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	Tx BT LE	2402 MHz 2440 MHz 2480 MHz

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	Wireless Control Device	HAC-024	XHL07000021332 *1) XHL07000021011 *2)	Nintendo	EUT
B	Switch dock	HAC-007	XFL10000010640	Nintendo	-
C	AC Adapter	HAC-002	No.1	Nintendo	-

*1) Used for Conducted Emission test and Radiated Emission test
*2) Used for Antenna Terminal conducted test

This E.U.T. has three venders about crystal.
These crystals are compatible and are electrically identical having same radio parameters.
So, crystal A was selected as a worse type by preliminary tests.

	Crystal A	Crystal B	Crystal C
Vender	TXC	KDS	Murata

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	0.3	Shielded	Shielded	HAC-010, Supplied with the EUT when marketed
2	Signal Cable	0.2	Unshielded	Unshielded	*3)
3	USB Cable	1.5	Shielded	Shielded	Part of HAC-002

*3) This cable is used for test operation, not attached to the product.

SECTION 5: Conducted Emission

Test Procedure and conditions

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 rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

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

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

Detector	**: QP and CISPR AV**
Measurement range	**: 0.15 MHz - 30 MHz**
Test data	**: APPENDIX**
Test result	**: Pass**

SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]
EUT was placed on a polystyrene platform of nominal size, 0.5 m by 0.5 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 polystyrene platform of nominal size, 0.5 m by 0.8 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.
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(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: 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
Test Distance	3 m	3.98 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3.98 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)

*1) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".
*2) Distance Factor: 20 x log (3.98 m / 3.0 m) = 2.45 dB,
*3) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB

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	Carrier	Spurious (Below 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz - 18 GHz)	Spurious (Above 18 GHz)
Horizontal	Y	X	Y	Y	X
Vertical	Z	X	Z	Z	X

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

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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

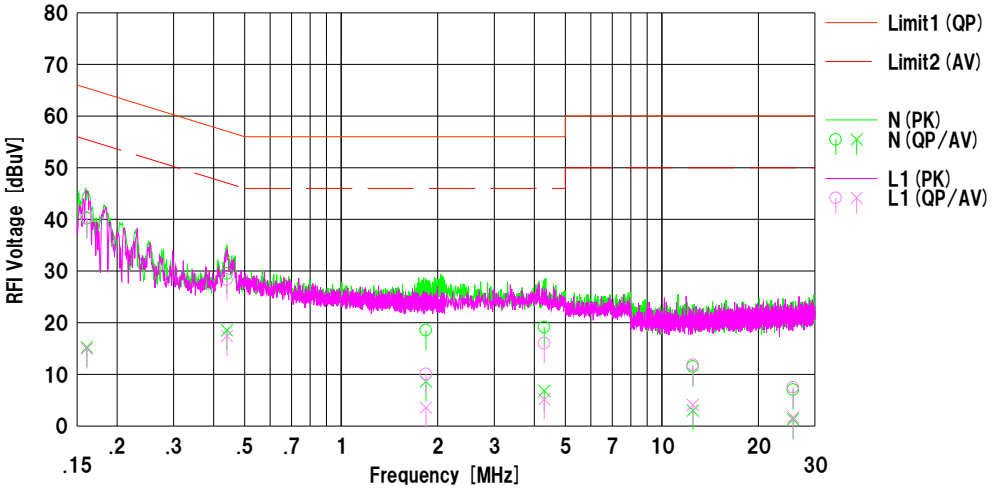
UL Japan,Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2018/05/16

Mode : TX BT LE 2480 MHz
Power : DC 5 V
Temp./Humi. : 24 deg.C / 54 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Makoto Hosaka

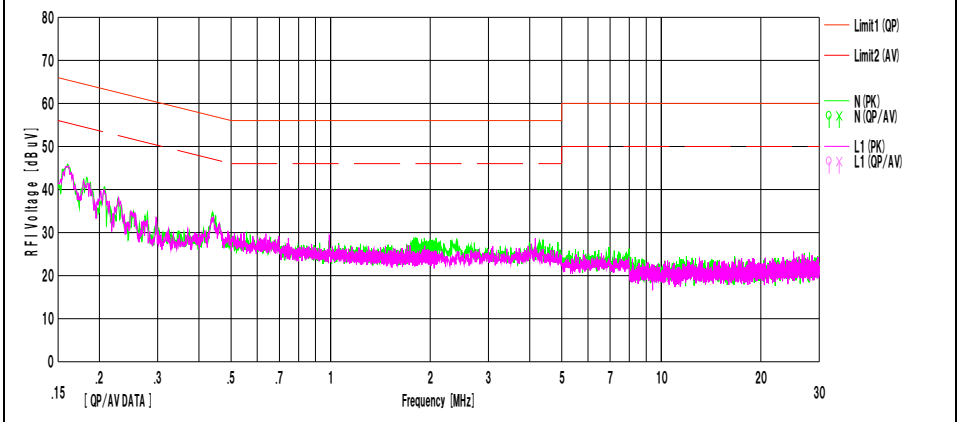


No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.16100	27.65	2.72	12.52	40.17	15.24	65.41	55.41	25.2	40.1	N	
2	0.44002	16.98	5.98	12.54	29.52	18.52	57.06	47.06	27.5	28.5	N	
3	1.83679	5.83	-4.12	12.72	18.55	8.60	56.00	46.00	37.4	37.4	N	
4	4.29869	6.12	-6.21	13.02	19.14	6.81	56.00	46.00	36.8	39.1	N	
5	12.49184	-2.68	-11.17	14.18	11.50	3.01	60.00	50.00	48.5	46.9	N	
6	25.65548	-8.23	-13.97	15.26	7.03	1.29	60.00	50.00	52.9	48.7	N	
7	0.16100	27.82	2.48	12.52	40.34	15.00	65.41	55.41	25.0	40.4	L1	
8	0.44003	15.79	4.89	12.54	28.33	17.43	57.06	47.06	28.7	29.6	L1	
9	1.83679	-2.66	-9.17	12.72	10.06	3.55	56.00	46.00	45.9	42.4	L1	
10	4.29869	3.01	-7.85	13.02	16.03	5.17	56.00	46.00	39.9	40.8	L1	
11	12.49184	-2.34	-10.11	14.18	11.84	4.07	60.00	50.00	48.1	45.9	L1	
12	25.65548	-7.78	-13.61	15.26	7.48	1.65	60.00	50.00	52.5	48.3	L1	

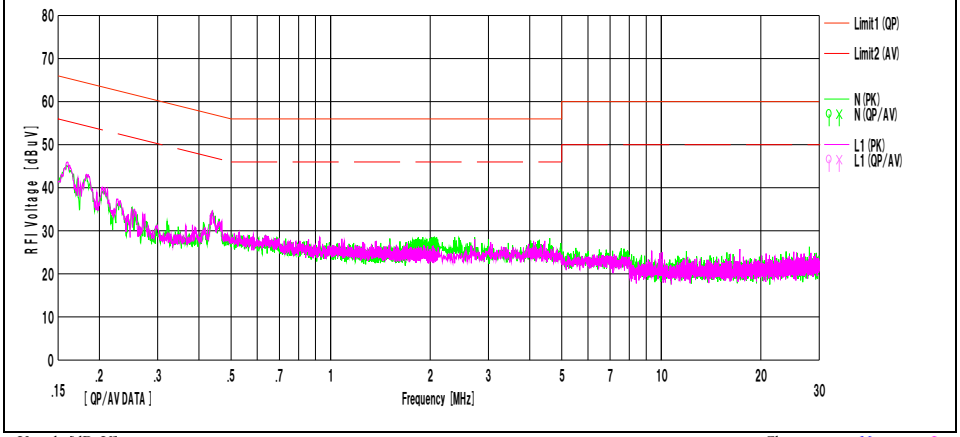
Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) :SLS-02

Conducted Emission

2402 MHz



2440 MHz



Y scale [dBuV] Chart — N — L

6 dB Bandwidth and 99 % Occupied Bandwidth

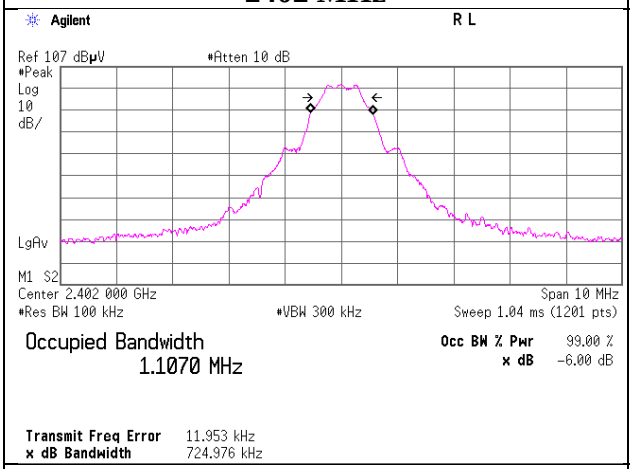
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	12309349S-A-R3
Date	May 16, 2018
Temperature / Humidity	24 deg. C / 49 %RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
BT LE	2402	1069.4	0.725	> 0.5000
	2440	1070.3	0.724	> 0.5000
	2480	1070.9	0.736	> 0.5000

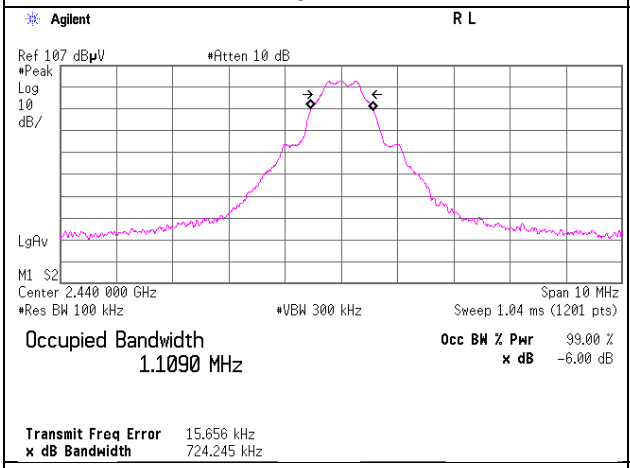
6 dB Bandwidth and 99 % Occupied Bandwidth

6 dB Bandwidth

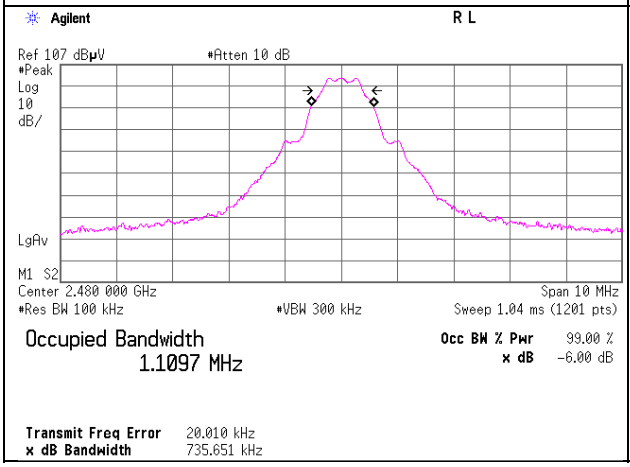
2402 MHz



2440 MHz

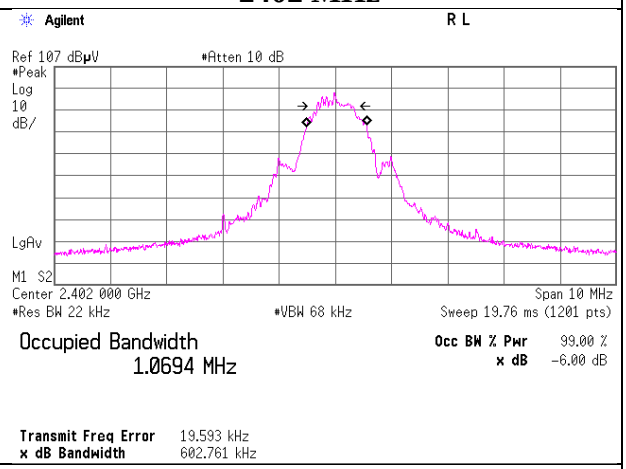


2480 MHz

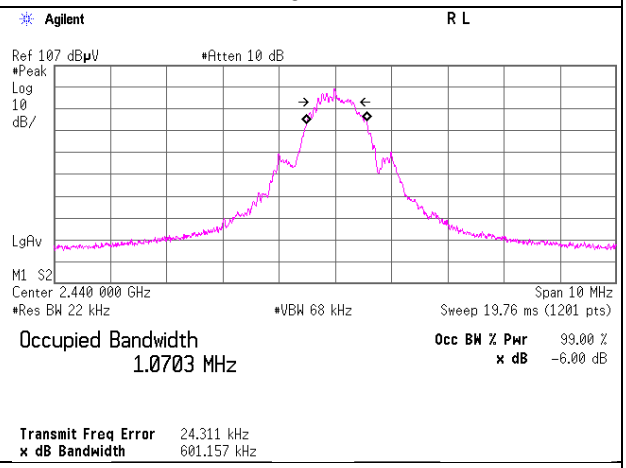


99 % Occupied Bandwidth

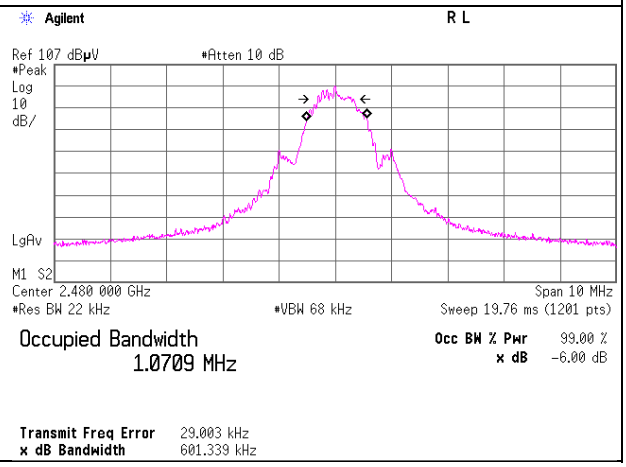
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Report No.	12309349S-A-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	May 9, 2018
Temperature / Humidity	25 deg. C / 49 % RH
Engineer	Kazutaka Takeyama
Mode	Tx BT LE

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-8.16	1.97	9.88	3.69	2.34	30.00	1000	26.31	-0.94	2.75	1.88	36.02	4000	33.27
2440	-6.90	1.98	9.88	4.96	3.13	30.00	1000	25.04	-0.94	4.02	2.52	36.02	4000	32.00
2480	-6.05	1.99	9.88	5.82	3.82	30.00	1000	24.18	-0.94	4.88	3.08	36.02	4000	31.14

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

Average Output Power
(Reference data for RF Exposure)

Report No.	12309349S-A-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	May 9, 2018
Temperature / Humidity	25 deg. C / 49 % RH
Engineer	Kazutaka Takeyama
Mode	Tx BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-10.35	1.97	9.88	1.50	1.41	2.01	3.51	2.24
2440	-9.08	1.98	9.88	2.78	1.90	2.01	4.79	3.01
2480	-8.27	1.99	9.88	3.60	2.29	2.01	5.61	3.64

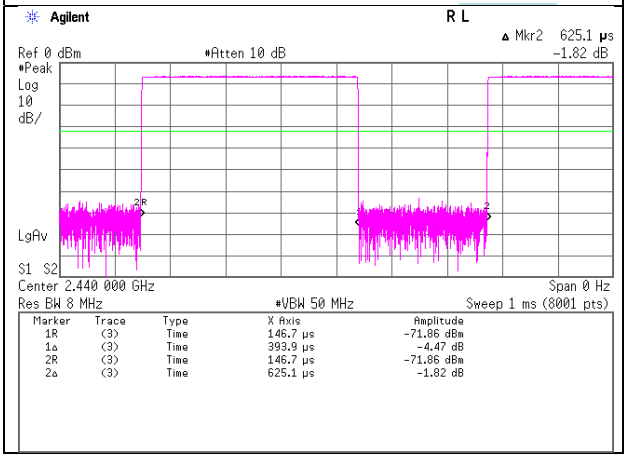
Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

Burst rate confirmation

Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Report No.	12309349S-A-R3
Date	May 16, 2018
Temperature / Humidity	24 deg. C / 49 %RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

BT LE

Tx on / (Tx on + Tx off) =	**0.630**
Tx on / (Tx on + Tx off) * 100 =	**63.0 %**
Duty factor = 10 * log (0.6251 / 0.3939) =	**2.01 dB**
Duty factor = 20 * log (0.6251 / 0.3939) =	**4.01 dB**



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

Radiated Spurious Emission

Report No.	12309349S-A-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	2	2	3
Date	May 15, 2018	May 5, 2018	May 7, 2018
Temperature / Humidity	24 deg. C / 49 % RH	25 deg. C / 52 % RH	24 deg. C / 40 % RH
Engineer	Shiro Kobayashi	Kazuya Noda	Kazuya Noda
	(30 MHz – 1 GHz)	(1 Hz – 13 GHz)	(13 MHz – 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.	127.910	QP	30.45	13.49	8.20	31.85	0.00	20.29	43.50	23.2	246	3	
Hori.	467.538	QP	32.95	16.85	7.32	31.66	0.00	25.46	46.00	20.5	100	24	
Hori.	555.024	QP	28.37	18.36	7.66	31.72	0.00	22.67	46.00	23.3	160	276	
Hori.	649.464	QP	33.17	19.34	8.06	31.66	0.00	28.91	46.00	17.0	133	283	
Hori.	664.142	QP	38.61	19.42	8.12	31.64	0.00	34.51	46.00	**11.4**	145	302	
Hori.	740.157	QP	34.77	20.02	8.43	31.50	0.00	31.72	46.00	14.2	125	291	
Hori.	754.840	QP	33.89	20.17	8.49	31.47	0.00	31.08	46.00	14.9	125	291	
Hori.	2390.000	PK	48.96	27.16	13.91	44.13	2.45	48.35	73.90	25.5	148	244	
Hori.	4804.000	PK	49.17	31.14	6.55	44.45	2.45	44.86	73.90	29.0	100	0	
Hori.	7206.000	PK	49.04	36.48	7.69	43.99	2.45	51.67	73.90	22.2	100	0	
Vert.	51.205	QP	31.49	10.38	7.22	31.91	0.00	17.18	40.00	22.8	100	93	
Vert.	53.519	QP	41.66	9.68	7.25	31.91	0.00	26.68	40.00	13.3	100	47	
Vert.	58.521	QP	37.12	8.17	7.32	31.90	0.00	20.71	40.00	19.2	100	355	
Vert.	62.607	QP	35.59	7.33	7.37	31.90	0.00	18.39	40.00	21.6	100	46	
Vert.	76.577	QP	34.58	6.21	7.56	31.89	0.00	16.46	40.00	23.5	100	231	
Vert.	88.318	QP	35.04	7.78	7.72	31.89	0.00	18.65	43.50	24.8	100	302	
Vert.	180.350	QP	22.37	16.13	8.73	31.80	0.00	15.43	43.50	28.0	100	1	
Vert.	192.045	QP	23.45	16.26	8.84	31.79	0.00	16.76	43.50	26.7	100	1	
Vert.	646.189	QP	33.61	19.32	8.04	31.66	0.00	29.31	46.00	16.6	100	353	
Vert.	664.084	QP	35.35	19.42	8.12	31.64	0.00	31.25	46.00	14.7	100	42	
Vert.	700.021	QP	30.93	19.62	8.27	31.60	0.00	27.22	46.00	18.7	134	265	
Vert.	701.881	QP	30.86	19.64	8.28	31.59	0.00	27.19	46.00	18.8	134	265	
Vert.	2390.000	PK	48.83	27.16	13.91	44.13	2.45	48.22	73.90	25.6	106	190	
Vert.	4804.000	PK	49.31	31.14	6.55	44.45	2.45	45.00	73.90	28.9	100	0	
Vert.	7206.000	PK	48.82	36.48	7.69	43.99	2.45	51.45	73.90	22.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.45 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	39.15	27.16	13.91	44.13	4.01	2.45	42.55	53.90	11.4	*1)
Hori.	4804.000	AV	39.22	31.14	6.55	44.45	4.01	2.45	38.92	53.90	15.0	
Hori.	7206.000	AV	38.92	36.48	7.69	43.99	4.01	2.45	45.56	53.90	8.3	
Vert.	2390.000	AV	38.51	27.16	13.91	44.13	4.01	2.45	41.91	53.90	12.0	*1)
Vert.	4804.000	AV	39.21	31.14	6.55	44.45	4.01	2.45	38.91	53.90	15.0	
Vert.	7206.000	AV	39.05	36.48	7.69	43.99	4.01	2.45	45.69	53.90	**8.2**	

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 (3.98 m / 3.0 m) = 2.45 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)

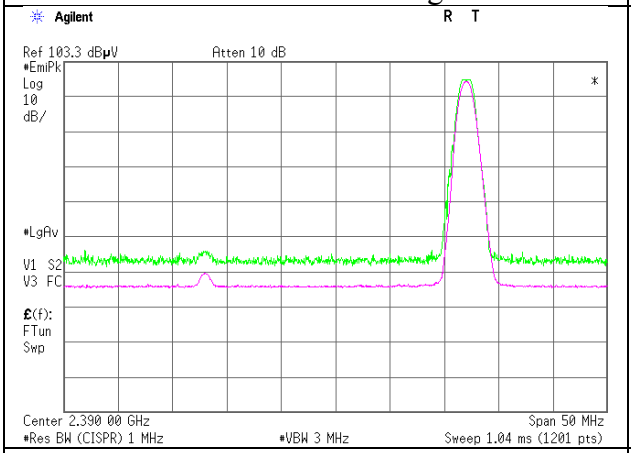
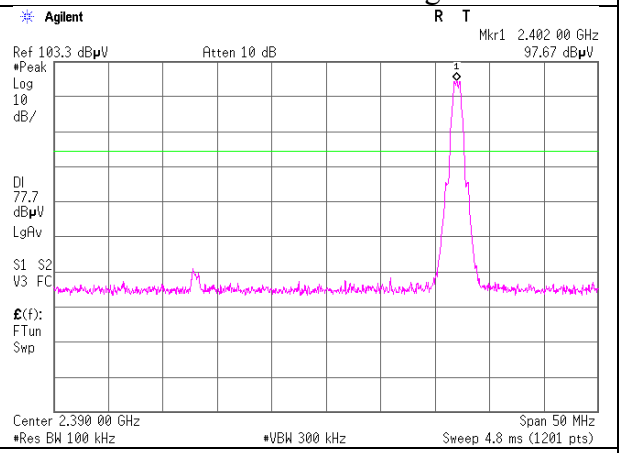
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

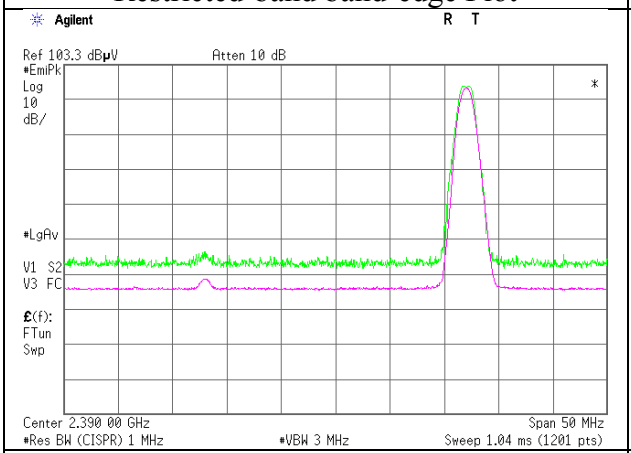
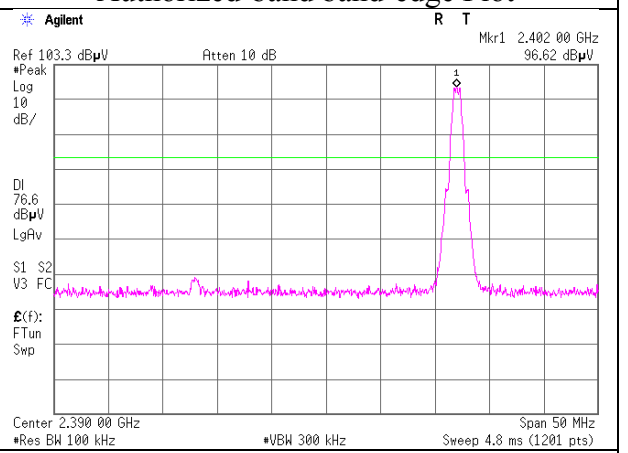
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	97.82	27.20	13.92	44.14	2.45	97.25	-	-	Carrier
Hori.	2400.000	PK	43.98	27.20	13.92	44.14	2.45	43.41	77.25	33.8	
Vert.	2402.000	PK	97.12	27.20	13.92	44.14	2.45	96.55	-	-	Carrier
Vert.	2400.000	PK	43.82	27.20	13.92	44.14	2.45	43.25	76.55	33.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.45 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.	12309349S-A-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	May 5, 2018
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
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

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

Radiated Spurious Emission

Report No.	12309349S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	2
Date	May 7, 2018	May 5, 2018
Temperature / Humidity	24 deg. C / 40 % RH	25 deg. C / 52 % RH
Engineer	Kazuya Noda	Kazuya Noda
	(30 MHz - 1 GHz)	(1 Hz – 13 GHz)
	(13 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.	127.900	QP	28.97	13.50	7.54	32.14	0.00	17.87	43.50	25.6	243	2	
Hori.	467.525	QP	33.98	16.79	9.71	31.97	0.00	28.51	46.00	17.4	100	33	
Hori.	555.036	QP	36.57	18.32	10.04	32.00	0.00	32.93	46.00	13.0	174	242	
Hori.	649.485	QP	34.01	19.25	10.40	31.98	0.00	31.68	46.00	14.3	138	233	
Hori.	664.169	QP	37.12	19.32	10.46	31.95	0.00	34.95	46.00	**11.0**	133	232	
Hori.	740.210	QP	33.28	19.92	10.74	31.82	0.00	32.12	46.00	13.8	123	224	
Hori.	754.611	QP	31.14	20.08	10.81	31.79	0.00	30.24	46.00	15.7	123	224	
Hori.	4880.000	PK	48.69	31.31	6.58	44.48	2.45	44.55	73.90	29.3	100	0	
Hori.	7320.000	PK	48.86	36.64	7.79	44.03	2.45	51.71	73.90	22.1	100	0	
Vert.	51.252	QP	36.67	10.36	6.95	32.19	0.00	21.79	40.00	18.2	100	82	
Vert.	53.326	QP	37.69	9.75	6.93	32.19	0.00	22.18	40.00	17.8	100	44	
Vert.	58.321	QP	37.01	8.28	6.79	32.19	0.00	19.89	40.00	20.1	100	351	
Vert.	62.628	QP	35.05	7.37	6.69	32.18	0.00	16.93	40.00	23.0	100	43	
Vert.	76.540	QP	36.42	6.22	7.50	32.17	0.00	17.97	40.00	22.0	122	216	
Vert.	88.494	QP	31.85	7.87	7.74	32.17	0.00	15.29	43.50	28.2	100	318	
Vert.	180.374	QP	27.41	16.06	8.03	32.09	0.00	19.41	43.50	24.0	100	351	
Vert.	192.010	QP	23.71	16.16	8.03	32.08	0.00	15.82	43.50	27.6	100	351	
Vert.	646.096	QP	33.32	19.24	10.39	31.98	0.00	30.97	46.00	15.0	100	354	
Vert.	664.099	QP	35.86	19.32	10.46	31.95	0.00	33.69	46.00	12.3	100	5	
Vert.	700.026	QP	27.93	19.48	10.60	31.87	0.00	26.14	46.00	19.8	144	271	
Vert.	701.895	QP	27.12	19.50	10.61	31.87	0.00	25.36	46.00	20.6	144	271	
Vert.	4880.000	PK	48.98	31.31	6.58	44.48	2.45	44.84	73.90	29.0	100	0	
Vert.	7320.000	PK	48.13	36.64	7.79	44.03	2.45	50.98	73.90	22.9	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.45 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.	4880.000	AV	39.24	31.31	6.58	44.48	4.01	2.45	39.11	53.90	14.8	
Hori.	7320.000	AV	38.42	36.64	7.79	44.03	4.01	2.45	45.28	53.90	**8.6**	
Vert.	4880.000	AV	39.51	31.31	6.58	44.48	4.01	2.45	39.38	53.90	14.5	
Vert.	7320.000	AV	38.16	36.64	7.79	44.03	4.01	2.45	45.02	53.90	8.9	

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 (3.98 m / 3.0 m) = 2.45 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.	12309349S-A-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	May 16, 2018	May 5, 2018	May 16, 2018	May 15, 2018
Temperature / Humidity	24 deg. C / 54 % RH	25 deg. C / 52 % RH	24 deg. C / 54 % RH	24 deg. C / 49 % RH
Engineer	Makoto Hosaka	Kazuya Noda	Makoto Hosaka	Makoto Hosaka
	(30 MHz – 1 GHz)	(1 GHz – 2.8 GHz)	(2.8 GHz – 13 GHz)	(13 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.	130.202	QP	27.29	13.65	8.22	31.85	0.00	17.31	43.50	26.1	172	7	
Hori.	467.567	QP	35.33	16.85	7.32	31.66	0.00	27.84	46.00	18.1	117	27	
Hori.	525.452	QP	34.87	17.90	7.54	31.68	0.00	28.63	46.00	17.3	188	314	
Hori.	653.514	QP	34.88	19.36	8.07	31.66	0.00	30.65	46.00	15.3	174	142	
Hori.	663.904	QP	34.09	19.42	8.12	31.64	0.00	29.99	46.00	16.0	144	133	
Hori.	740.023	QP	33.17	20.02	8.43	31.50	0.00	30.12	46.00	15.8	125	305	
Hori.	769.710	QP	32.33	20.32	8.55	31.45	0.00	29.75	46.00	16.2	114	296	
Hori.	2483.500	PK	49.65	27.48	13.98	44.16	2.45	49.40	73.90	24.5	141	283	
Hori.	4960.000	PK	49.21	31.48	6.75	44.51	2.45	45.38	73.90	28.5	150	1	
Hori.	7440.000	PK	48.54	36.81	7.87	44.08	2.45	51.59	73.90	22.3	150	1	
Vert.	51.077	QP	36.45	10.41	7.21	31.91	0.00	22.16	40.00	17.8	100	141	
Vert.	53.798	QP	36.89	9.59	7.25	31.91	0.00	21.82	40.00	18.1	100	101	
Vert.	58.520	QP	40.21	8.17	7.32	31.90	0.00	23.80	40.00	16.2	100	193	
Vert.	62.563	QP	37.01	7.34	7.37	31.90	0.00	19.82	40.00	20.1	100	185	
Vert.	76.713	QP	35.06	6.21	7.56	31.89	0.00	16.94	40.00	23.0	100	252	
Vert.	88.287	QP	33.49	7.77	7.72	31.89	0.00	17.09	43.50	26.4	100	68	
Vert.	180.350	QP	22.26	16.13	8.73	31.80	0.00	15.32	43.50	28.1	100	1	
Vert.	192.051	QP	23.21	16.26	8.84	31.79	0.00	16.52	43.50	26.9	100	1	
Vert.	646.659	QP	35.72	19.32	8.05	31.66	0.00	31.43	46.00	14.5	100	65	
Vert.	656.654	QP	36.51	19.38	8.09	31.65	0.00	32.33	46.00	**13.6**	100	68	
Vert.	699.796	QP	32.66	19.62	8.27	31.60	0.00	28.95	46.00	17.0	134	338	
Vert.	703.374	QP	32.91	19.65	8.28	31.59	0.00	29.25	46.00	16.7	135	334	
Vert.	2483.500	PK	49.52	27.48	13.98	44.16	2.45	49.27	73.90	24.6	228	234	
Vert.	4960.000	PK	49.31	31.48	6.75	44.51	2.45	45.48	73.90	28.4	150	1	
Vert.	7440.000	PK	48.10	36.81	7.87	44.08	2.45	51.15	73.90	22.7	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.45 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	39.74	27.48	13.98	44.16	4.01	2.45	43.50	53.90	10.4	*1)
Hori.	4960.000	AV	40.03	31.48	6.75	44.51	4.01	2.45	40.21	53.90	13.7	
Hori.	7440.000	AV	38.87	36.81	7.87	44.08	4.01	2.45	45.93	53.90	8.0	
Vert.	2483.500	AV	39.75	27.48	13.98	44.16	4.01	2.45	43.51	53.90	10.4	*1)
Vert.	4960.000	AV	40.45	31.48	6.75	44.51	4.01	2.45	40.63	53.90	13.3	
Vert.	7440.000	AV	39.02	36.81	7.87	44.08	4.01	2.45	46.08	53.90	**7.8**	

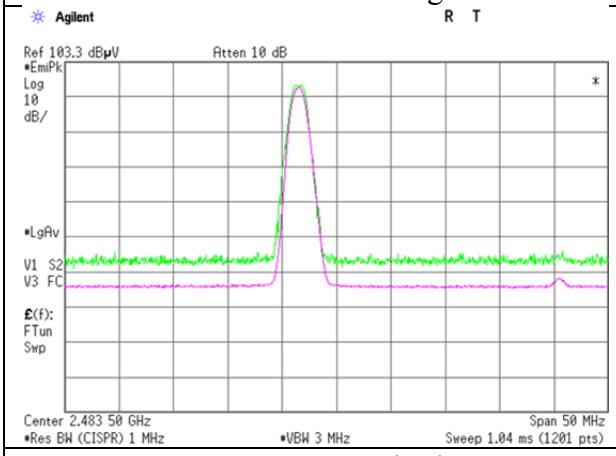
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.45 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12309349S-A-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	May 5, 2018
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

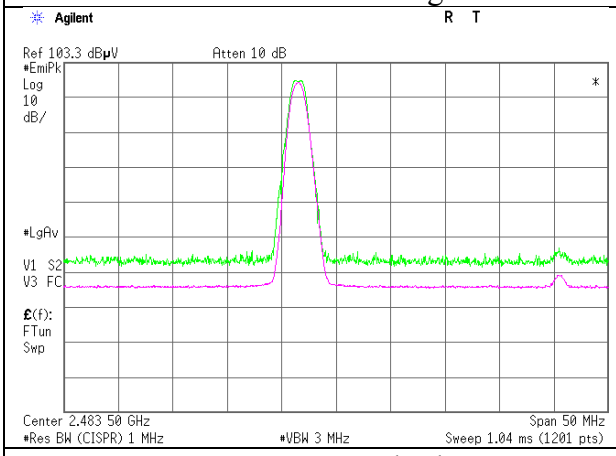
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

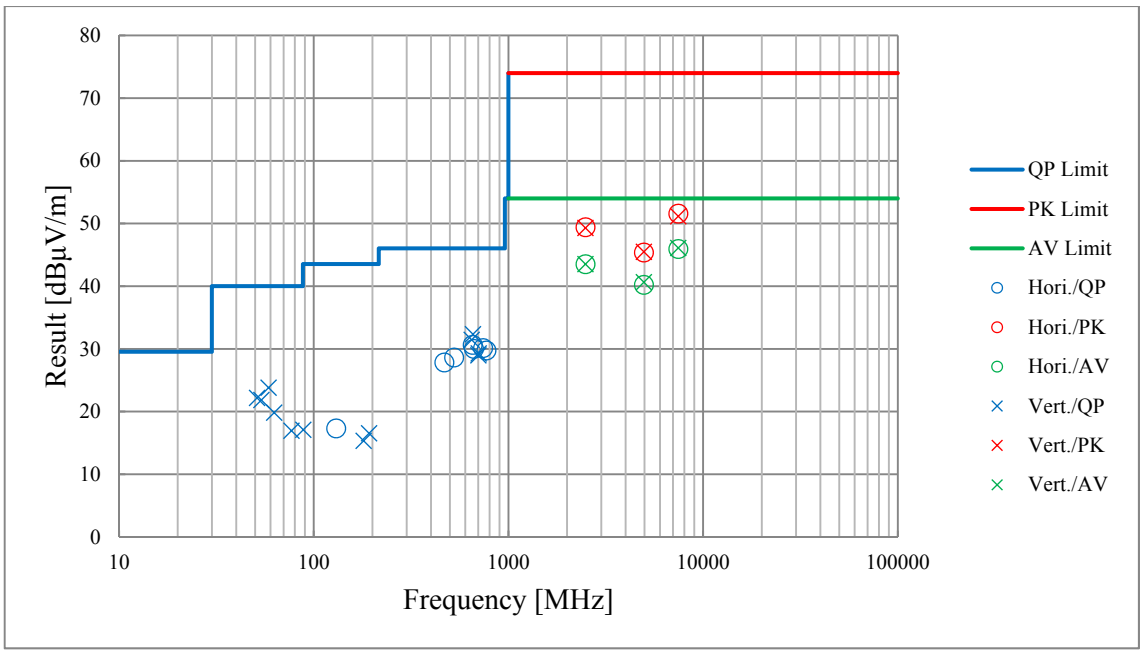


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12309349S-A-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	2	2
Date	May 16, 2018	May 5, 2018	May 16, 2018	May 15, 2018
Temperature / Humidity	24 deg. C / 54 % RH	25 deg. C / 52 % RH	24 deg. C / 54 % RH	24 deg. C / 49 % RH
Engineer	Makoto Hosaka	Kazuya Noda	Makoto Hosaka	Makoto Hosaka
	(30 MHz – 1 GHz)	(1 GHz – 2.8 GHz)	(2.8 GHz – 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 2480 MHz			

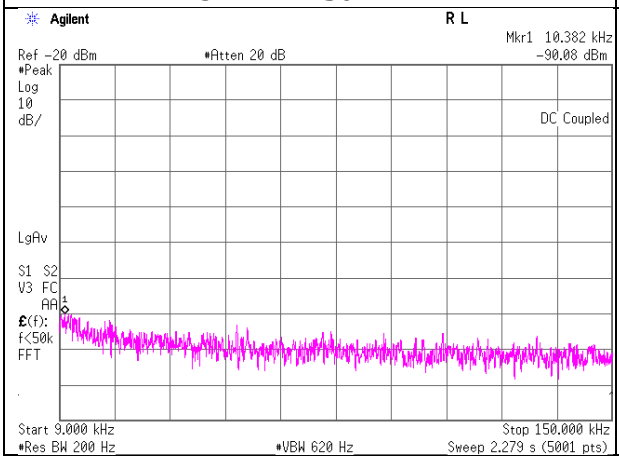


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

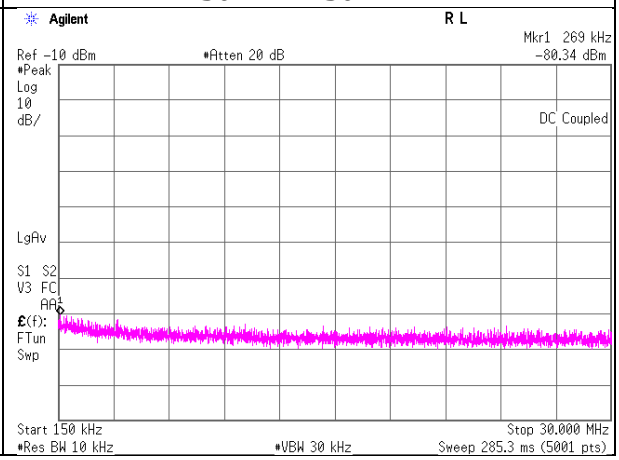
Conducted Spurious Emission

Report No.	12309349S-A-R3
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	May 16, 2018
Temperature / Humidity	24 deg. C / 49 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.38	-90.1	0.01	9.8	2.0	1	-78.3	300	6.0	-17.0	47.2	64.2	
269.00	-80.3	0.01	9.8	2.0	1	-68.5	300	6.0	-7.3	19.0	26.3	

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

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

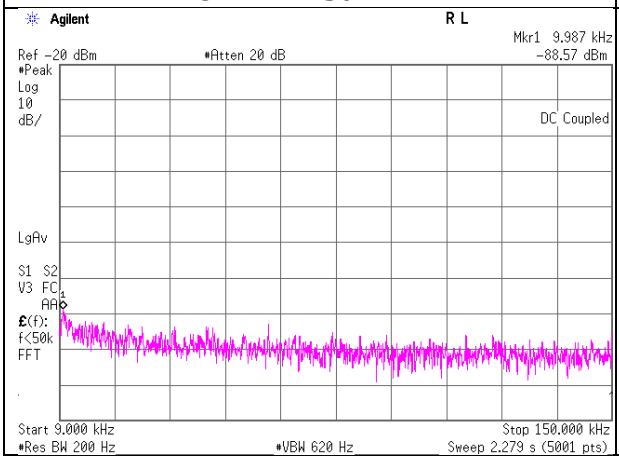
N: Number of output

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

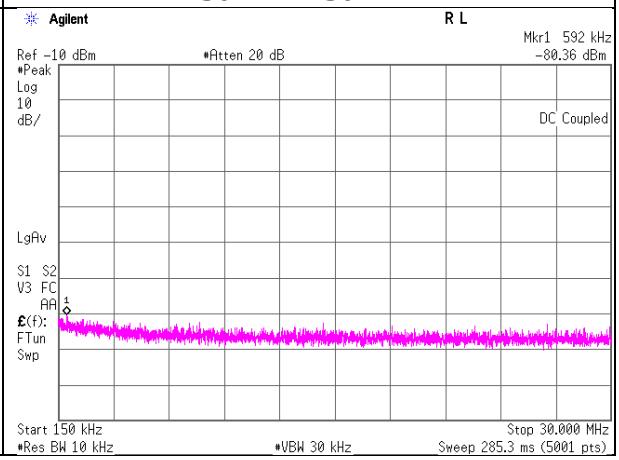
Conducted Spurious Emission

Report No.	12309349S-A-R3
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	May 16, 2018
Temperature / Humidity	24 deg. C / 49 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.99	-88.6	0.01	9.8	2.0	1	-76.8	300	6.0	-15.5	47.6	63.1	
592.00	-80.4	0.01	9.8	2.0	1	-68.5	30	6.0	12.7	32.1	19.4	

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

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

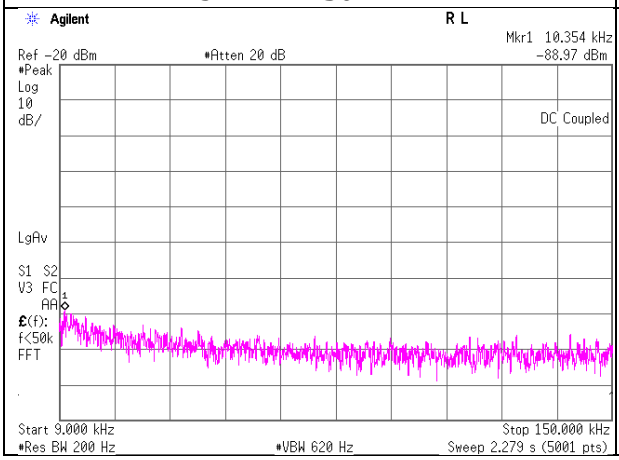
N: Number of output

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

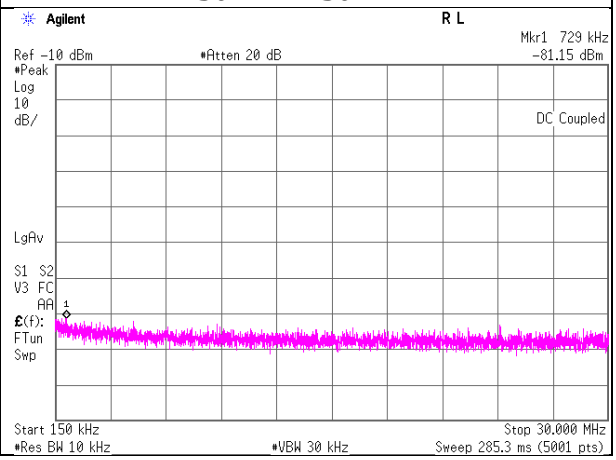
Conducted Spurious Emission

Report No.	12309349S-A-R3
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	May 16, 2018
Temperature / Humidity	24 deg. C / 49 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.35	-89.0	0.01	9.8	2.0	1	-77.2	300	6.0	-15.9	47.3	63.2	
729.00	-81.2	0.01	9.8	2.0	1	-69.3	30	6.0	11.9	30.3	18.4	

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

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

N: Number of output

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

Power Density

Report No.	12309349S-A-R3
Test place	Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date	May 16, 2018
Temperature / Humidity	24 deg. C / 49 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-22.64	1.97	9.88	-10.79	8.00	18.79
2440.00	-21.59	1.98	9.88	-9.73	8.00	17.73
2480.00	-20.65	1.99	9.88	-8.78	8.00	16.78

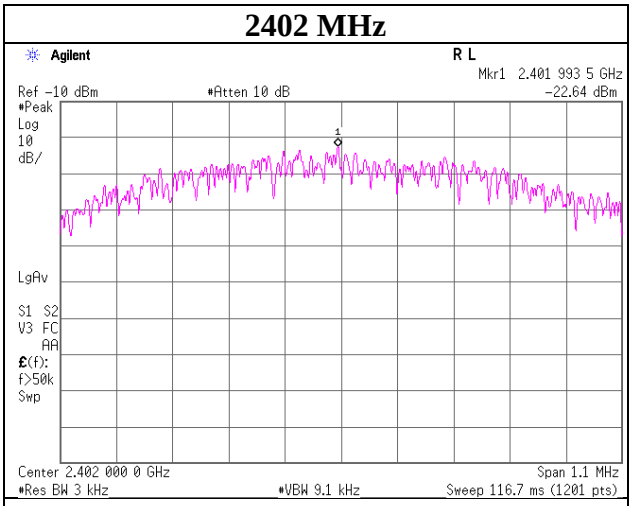
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

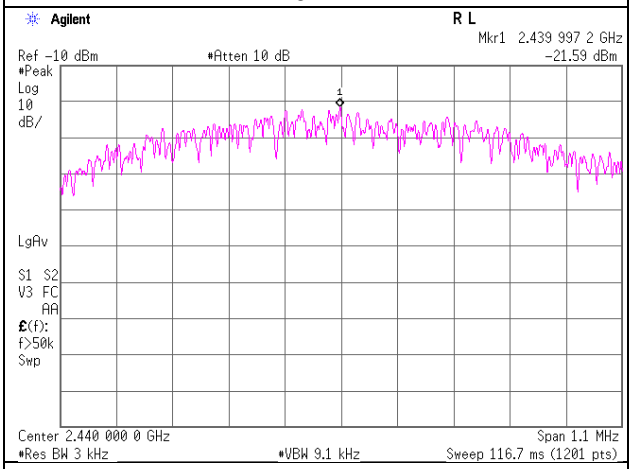
Power Density

BT LE

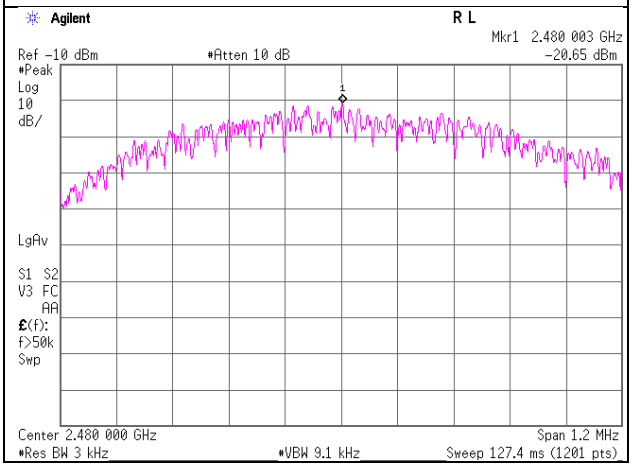
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test Instruments (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2018/02/16 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2018/02/16 * 12
SAT3-11	Attenuator	JFW	50HF-003N	-	RE	2018/02/22 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2017/11/23 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2018/04/07 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2018/04/07 * 12
SLA-06	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	195	RE	2018/01/30 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2017/10/30 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2017/06/08 * 12
SAEC-02(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2017/07/18 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE, CE,RFI,MF)	-	CE,RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2018/03/08 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2018/02/15 * 12
SCC-G44	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 104	800070/4A	RE	2018/03/28 * 12
SCC-G43	Coaxial Cable	HUBER+SUHNER	SUCOFLEX_104_E	SN MY 13406/4E	RE	2017/07/10 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2017/08/14 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2018/04/20 * 12
SCC-B12/B13/SRSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(RF Selector)	CE	2018/04/07 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2017/12/21 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE,CE	2017/09/26 * 12
SJM-09	Measure	PROMART	SEN1935	-	CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	CE	2018/03/08 * 12
SLS-02	LISN	Rohde & Schwarz	ENV216	100512	CE	2018/02/26 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2017/09/08 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	RE	2018/01/29 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2018/03/19 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2018/03/20 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 12
SRENT-15	Spectrum Analyzer	Agilent	E4440A	MY46185516	AT,RE	2017/12/26 * 12

Test Instruments (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SCC-G31	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	OCT-08-13-046	AT	2018/04/20 * 12
SAT10-13	Attenuator	Weinschel Corp.	54A-10	81626	AT	2018/03/19 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2017/04/25 * 12 *1)
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2017/04/25 * 12 *1)
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	-	RE	2018/04/20 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S005	RE	2018/01/29 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2018/03/05 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2017/10/02 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2018/01/30 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C3/ C4/C5/C10/SRS E-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/ 141PE/141PE/14 1PE/141PE/NS4 906	-/0901-271(RF Selector)	RE	2018/04/09 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2018/02/16 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2017/11/24 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2017/10/16 * 12

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

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test