RADIO TEST REPORT

Test Report No. : 13226743H-B-R3

Applicant	:	**silex technology, Inc.**
Type of EUT	:	**Wireless E84 Digital Communication Device**
Model Number of EUT	:	**WDCD-3310**
FCC ID	:	**N6C-WDCD3310**
Test regulation	:	**FCC Part 15 Subpart C: 2020**
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.
4. The test results in this test report are traceable to the national or international standards.
5. This test report covers Radio technical requirements.
   It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.
8. The information provided from the customer for this report is identified in Section 1.
9. This report is a revised version of 13226743H-B-R2. 13226743H-B-R2 is replaced with this report.

Date of test: March 19 to August 26, 2020

Representative test engineer:
Yuta Moriya
Engineer
Consumer Technology Division

Approved by:
Satofumi Matsuyama
Engineer
Consumer Technology Division

NVLAP TESTING NVLAP LAB CODE 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://japan.ul.com/resources/emc_accredited/

☐ This report contains data that are not covered by the NVLAP accreditation.
☒ There is no testing item of "Non-accreditation".

REVISION HISTORY

Original Test Report No.: 13226743H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13226743H-B	July 29, 2020	-	-
1	13226743H-B-R1	August 20, 2020	P 11	Addition of No.F: Terminal information Addition of explanatory note *1)
1	13226743H-B-R1	August 20, 2020	P 22	Correction of Attenuator Loss of Power Setting -20 dBm in APPENDIX 1: Test data (Maximum Peak Output Power) 9.77 dB → 0 dB
1	13226743H-B-R1	August 20, 2020	P 36	Deletion of Local ID MPM-12, MPSE-17 in APPENDIX 2: Test instruments
2	13226743H-B-R2	August 26, 2020	P 1	Correction of Date of test March 19 to June 30, 2020→March 19 to August 26, 2020
2	13226743H-B-R2	August 26, 2020	P 5	Correction of Receipt Date of Sample in Section 2.1 March 11, 2020→ March 11, 2020 (The test data before March 24, 2020 used this samples.) *1) June 9, 2020 (The test data after June 25, 2020 used this samples.) *1) The samples received on March 11, 2020 did not differ from the samples received on June 9, 2020. Therefore, the data for the tests performed with samples received on March 11, 2020 was used.
2	13226743H-B-R2	August 26, 2020	P 7	Correction of Test Specification in Section 3.1. FCC Part 15 final revised on May 26, 2020 and effective July 27, 2020 except 15.258→ FCC Part 15 final revised on June 26, 2020 and effective July 27, 2020 Addition of below explanatory note. * The revision does not affect the test result conducted before its effective date.
2	13226743H-B-R2	August 26, 2020	P 22, 23	Replacement to new test data of Power Setting 0 dBm in APPENDIX 1: Test data (Maximum Peak Output Power / Average Output Power)
2	13226743H-B-R2	August 26, 2020	P 22,23	Correction of Result [mW] of Power Setting -20 dBm in APPENDIX 1: Test data (Maximum Peak Output Power / Average Output Power) P22: Conducted: 0.00 → 0.001 e.i.r.p: 2403 MHz, 2480 MHz: 0.00 → 0.003 2440 MHz: 0.00 → 0.004 P23: 0.00 → 0.001
3	13226743H-B-R3	August 31, 2020	P 5	Correction of explanatory note for Receipt Date of Sample *1) in Section2.1 *1) The samples received on March 11, 2020 did not differ from the samples received on June 9, 2020.Therefore, the data for the tests performed with samples received on March 11, 2020 was used. → *1) The samples received on June 9, 2020 have improved spurious emission characteristics over the samples received on March 11, 2020, due to improvements in the electromagnetic wave absorption sheet. There was no difference in the maximum peak output power test (for power setting: 0 dBm) results between the samples received on March 11, 2020 and the samples received on June 9, 2020, therefore the test data performed with samples received on March 11, 2020 was used for the following test items: 6 dB Bandwidth and 99 % Occupied Bandwidth Maximum Peak Output Power and Average Output Power (for power setting -20dBm) Conducted Spurious Emission

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	:	silex technology, Inc.
Address	:	2-3-1 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-0237, Japan
Telephone Number	:	+81-774-98-3878
Facsimile Number	:	+81-774-98-3758
Contact Person	:	Keisuke Ishiro

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	:	Wireless E84 Digital Communication Device
Model No.	:	WDCD-3310
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 24 V
Receipt Date of Sample (Information from test lab.)	:	March 11, 2020 (The test data before March 24, 2020 used this samples.) *1) June 9, 2020 (The test data after June 25, 2020 used this samples.) *1) The samples received on June 9, 2020 have improved spurious emission characteristics over the samples received on March 11, 2020, due to improvements in the electromagnetic wave absorption sheet. There was no difference in the maximum peak output power test (for power setting: 0 dBm) results between the samples received on March 11, 2020 and the samples received on June 9, 2020, therefore the test data performed with samples received on March 11, 2020 was used for the following test items: 6 dB Bandwidth and 99 % Occupied Bandwidth Maximum Peak Output Power and Average Output Power (for power setting -20dBm) Conducted Spurious Emission
Country of Mass-production	:	Japan
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: WDCD-3310 (referred to as the EUT in this report) is a Wireless E84 Digital Communication Device.

Radio Specification

Radio Type	:	Transceiver
Method of Frequency Generation	:	Synthesizer

[short-range wireless 2.4 GHz] *

Radio Type	:	Transceiver
Frequency of Operation	:	2403 MHz to 2480 MHz
Modulation	:	FSK
Antenna type	:	PCB Antenna
Antenna Gain	:	6 dBi
Clock frequency (Maximum)	:	32 MHz

[short-range wireless 5.8 GHz]

Radio Type	:	Transceiver
Frequency of Operation	:	5726 MHz to 5825 MHz
Modulation	:	FSK
Antenna type	:	PCB Antenna
Antenna Gain	:	1.0 dBi
Clock frequency (Maximum)	:	32 MHz

* This test report applies to 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 June 26, 2020 and effective July 27, 2020

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.

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	10.29 dB, 23.19463 MHz, L, AV	Complied a)	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(b)(3)		Complied c)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(e)		Complied d)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	3.7 dB 7320.000 MHz, AV, Horizontal	Complied# e), f)	Conducted (below 30 MHz)/ 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 Conducted Emission)
b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)
c) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
d) Refer to APPENDIX 1 (data of Power Density)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) 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 Module regardless of input voltage.
Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
The EUT has an external antenna connector, but it is installed by the professionals.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)					

Other than above, 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.

Ise EMC Lab.

Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.4 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.6 dB

Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.4 dB
	0.15 MHz to 30 MHz	2.9 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
	(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	4.8 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
	(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	4.9 dB
	6 GHz to 18 GHz	5.2 dB
1 m	10 GHz to 26.5 GHz	5.5 dB
	26.5 GHz to 40 GHz	5.5 dB
10 m	1 GHz to 18 GHz	5.2 dB

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

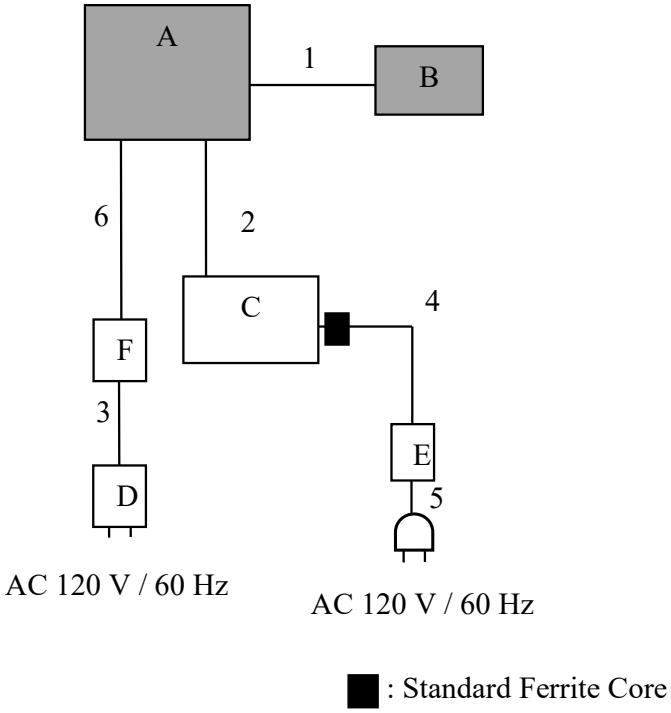
4.1 Operating Mode(s)

Mode	Remarks*
Transmitting (2.4 GHz)	**Tx**
*Transmitting duty was 100 % on all tests.	
*Power of the EUT was set by the software as follows; Power settings: 0 dBm (All Tests) , -20dBm (Maximum Peak Output Power only) Software: TeraTerm Ver 4.102 (Date: 2020.3.19, 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.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Radiated Spurious Emission (Above 1 GHz), Radiated Spurious Emission (Below 1 GHz) Conducted Emission Conducted Spurious Emission, 6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth, Conducted Spurious Emission	Tx	2403 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.

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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless E84 Digital Communication Device	WDCD-3310	001	silex technology, Inc.	EUT
B	Antenna	JUM2458PO_W1	002	silex technology, Inc.	EUT
C	Laptop PC	CF-LX4EDHCS	5GKSA17377	Panasonic	-
D	AC Adapter	WB-18D12R	Y19490019464	Asian Power Device. Inc	-
E	AC Adapter	CF-AA62J2C	64B2CM1147037 55B	Panasonic	-
F	Terminal	Jig1	001	silex technology, Inc.	*1)

*1) DC power passes because F is a termination connector. DC power output from D is directly supplied to A.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.4	Shielded	Shielded	-
2	RS-232C Cable	1.1	Shielded	Shielded	-
3	DC Cable	1.9	Unshielded	Unshielded	-
4	DC Cable	0.8	Unshielded	Unshielded	-
5	AC Cable	0.9	Unshielded	Unshielded	-
6	Signal and DC Cable	3.0	Shielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 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.

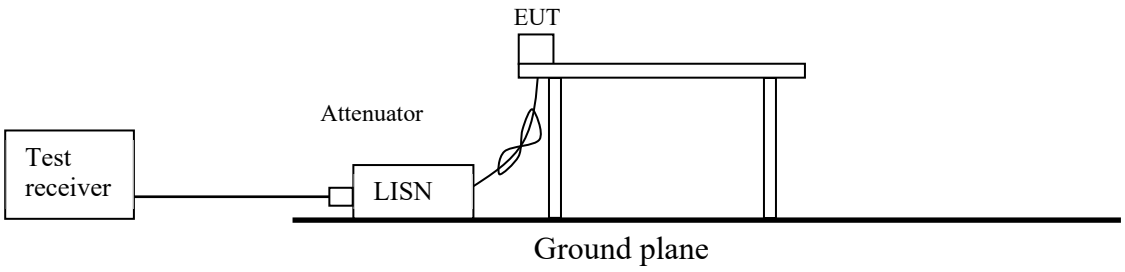
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN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

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

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

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

Figure 1: Test Setup



SECTION 6: 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 urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[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.

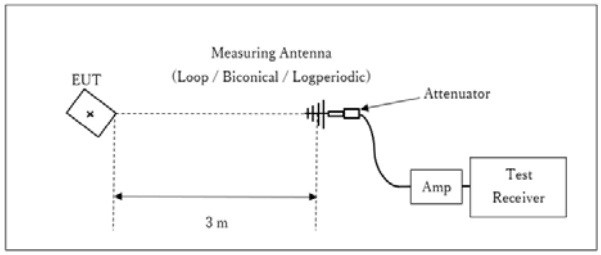
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	11.12.2.5.1 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces 11.12.2.5.2 The duty cycle was less than 98% for detected noise, a duty factor was added to the 11.12.2.5.1 results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on ANSI C63.10-2013.

Figure 2: Test Setup

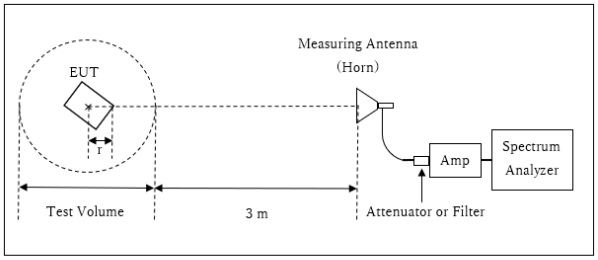
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

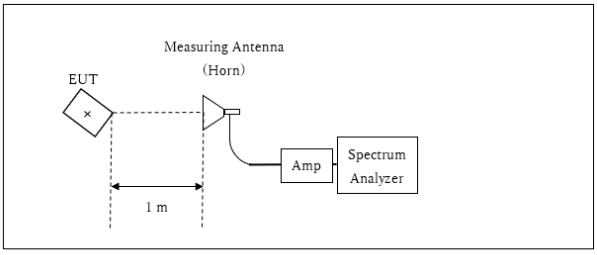


r : Radius of an outer periphery of EUT
× : Center of turn table

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

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

10 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

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

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

Measurement range : 30 MHz - 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	3 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: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4), *5)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*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 = 9.1 kHz)
*5) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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

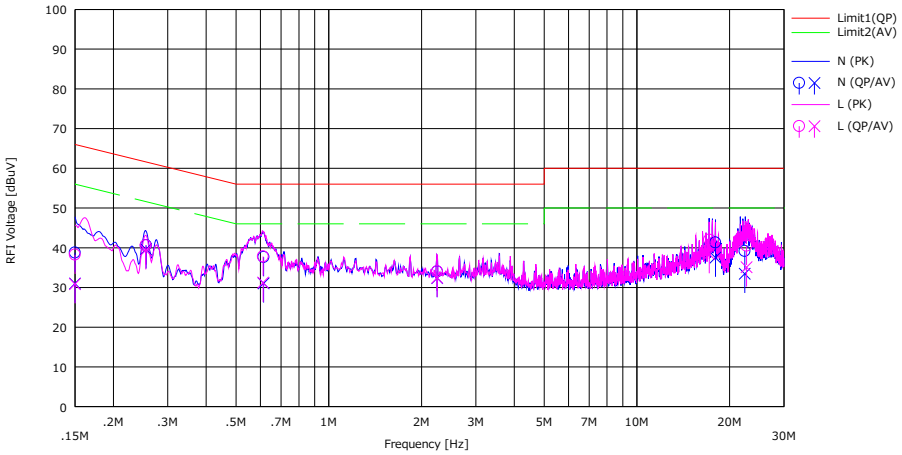
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Report No.	13226743H
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Date	June 28, 2020
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Takeshi Hiyaji
Mode	Tx 2403 MHz

Limit : FCC_Part 15 Subpart C(15.207)



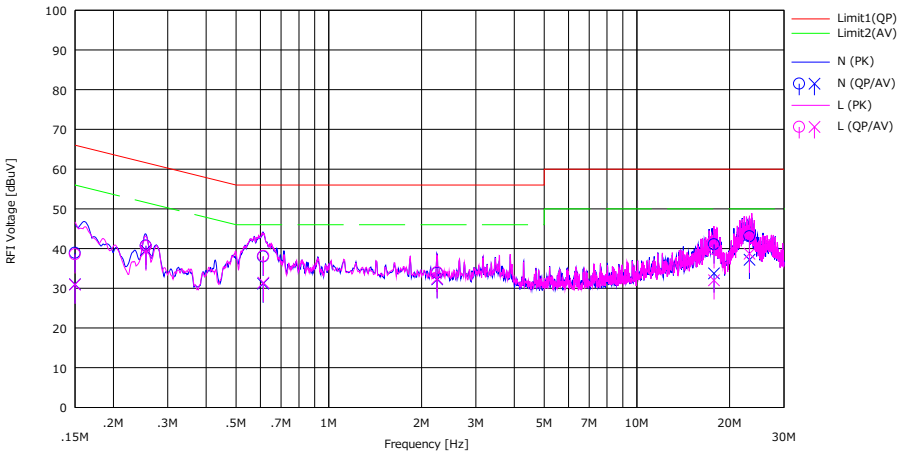
No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	25.50	17.70	0.15	13.14	38.79	30.99	66.00	56.00	27.21	25.01	N	
2	0.25522	27.30	26.30	0.15	13.16	40.61	39.61	61.60	51.60	20.99	11.99	N	
3	0.61428	24.30	17.70	0.16	13.19	37.65	31.05	56.00	46.00	18.35	14.95	N	
4	2.24754	20.40	18.80	0.28	13.30	33.98	32.38	56.00	46.00	22.02	13.62	N	
5	17.98063	24.80	21.00	2.70	13.79	41.29	37.49	60.00	50.00	18.71	12.51	N	
6	22.38767	21.70	16.00	3.59	13.87	39.16	33.46	60.00	50.00	20.84	16.54	N	
7	0.15000	24.90	17.50	0.20	13.14	38.24	30.84	66.00	56.00	27.76	25.16	L	
8	0.25477	27.20	26.00	0.22	13.16	40.58	39.38	61.60	51.60	21.02	12.22	L	
9	0.61178	24.40	17.80	0.22	13.19	37.81	31.21	56.00	46.00	18.19	14.79	L	
10	2.24771	20.40	18.80	0.35	13.30	34.05	32.45	56.00	46.00	21.95	13.55	L	
11	17.16480	25.60	22.00	2.62	13.77	41.99	38.39	60.00	50.00	18.01	11.61	L	
12	22.68570	22.90	17.50	3.71	13.88	40.49	35.09	60.00	50.00	19.51	14.91	L	

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

Conducted Emission

Report No.	13226743H
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Date	June 28, 2020
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Takeshi Hiyaji
Mode	Tx 2440 MHz

Limit : FCC_Part 15 Subpart C(15.207)



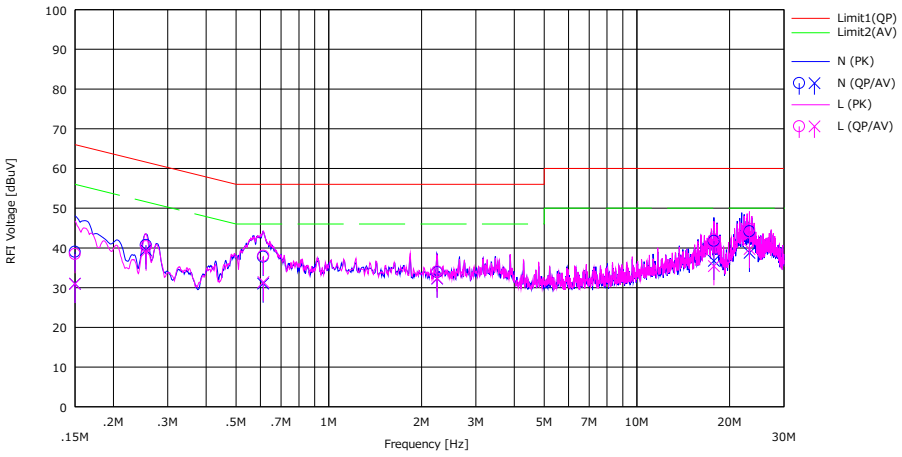
No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈AV〉			〈QP〉	〈AV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	25.60	17.70	0.15	13.14	38.89	30.99	66.00	56.00	27.11	25.01	N	
2	0.25483	27.40	26.30	0.15	13.16	40.71	39.61	61.60	51.60	20.89	11.99	N	
3	0.61220	24.60	17.80	0.16	13.19	37.95	31.15	56.00	46.00	18.05	14.85	N	
4	2.24829	20.30	18.70	0.28	13.30	33.88	32.28	56.00	46.00	22.12	13.72	N	
5	17.78849	24.60	17.30	2.66	13.78	41.04	33.74	60.00	50.00	18.96	16.26	N	
6	23.20179	25.40	19.50	3.76	13.89	43.05	37.15	60.00	50.00	16.95	12.85	N	
7	0.15000	25.20	17.60	0.20	13.14	38.54	30.94	66.00	56.00	27.46	25.06	L	
8	0.25510	27.20	25.90	0.22	13.16	40.58	39.28	61.60	51.60	21.02	12.32	L	
9	0.61345	24.70	18.00	0.22	13.19	38.11	31.41	56.00	46.00	17.89	14.59	L	
10	2.24813	20.40	18.80	0.35	13.30	34.05	32.45	56.00	46.00	21.95	13.55	L	
11	17.78936	23.30	15.50	2.74	13.78	39.82	32.02	60.00	50.00	20.18	17.98	L	
12	23.19396	26.30	21.00	3.82	13.89	44.01	38.71	60.00	50.00	15.99	11.29	L	

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

Conducted Emission

Report No.	13226743H
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Date	June 28, 2020
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Takeshi Hiyaji
Mode	Tx 2480 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	25.70	17.70	0.15	13.14	38.99	30.99	66.00	56.00	27.01	25.01	N	
2	0.25506	27.40	26.20	0.15	13.16	40.71	39.51	61.60	51.60	20.89	12.09	N	
3	0.61220	24.40	17.70	0.16	13.19	37.75	31.05	56.00	46.00	18.25	14.95	N	
4	2.24837	20.30	18.70	0.28	13.30	33.88	32.28	56.00	46.00	22.12	13.72	N	
5	17.78139	25.30	20.30	2.66	13.78	41.74	36.74	60.00	50.00	18.26	13.26	N	
6	23.19647	26.50	21.10	3.76	13.89	44.15	38.75	60.00	50.00	15.85	11.25	N	
7	0.15000	25.10	17.60	0.20	13.14	38.44	30.94	66.00	56.00	27.56	25.06	L	
8	0.25534	27.00	25.70	0.22	13.16	40.38	39.08	61.60	51.60	21.22	12.52	L	
9	0.61345	24.60	18.00	0.22	13.19	38.01	31.41	56.00	46.00	17.99	14.59	L	
10	2.24763	20.40	18.70	0.35	13.30	34.05	32.35	56.00	46.00	21.95	13.65	L	
11	17.78605	25.60	18.90	2.74	13.78	42.12	35.42	60.00	50.00	17.88	14.58	L	
12	23.19463	27.00	22.00	3.82	13.89	44.71	39.71	60.00	50.00	15.29	10.29	L	

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

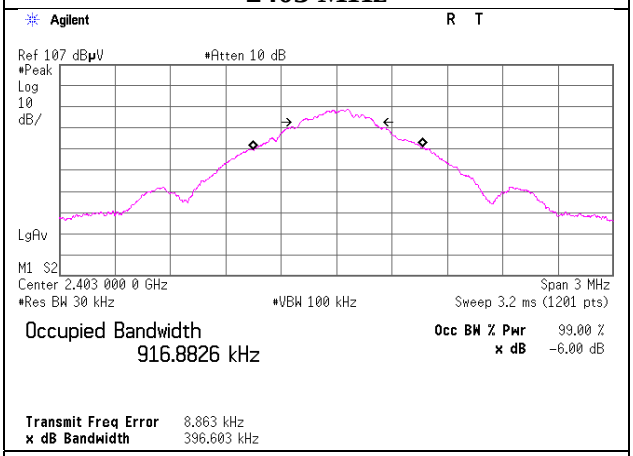
6 dB Bandwidth and 99 % Occupied Bandwidth

Report No.	13226743H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 19, 2020
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Yuta Moriya
Mode	Tx

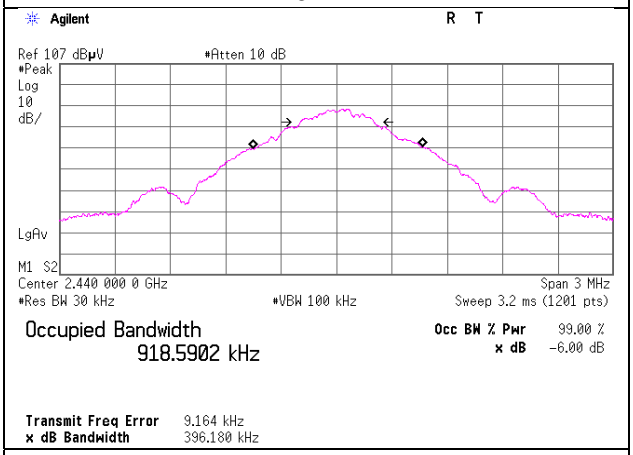
Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
2403	916.9	0.501	> 0.5000
2440	918.6	0.501	> 0.5000
2480	919.0	0.501	> 0.5000

99 % Occupied Bandwidth

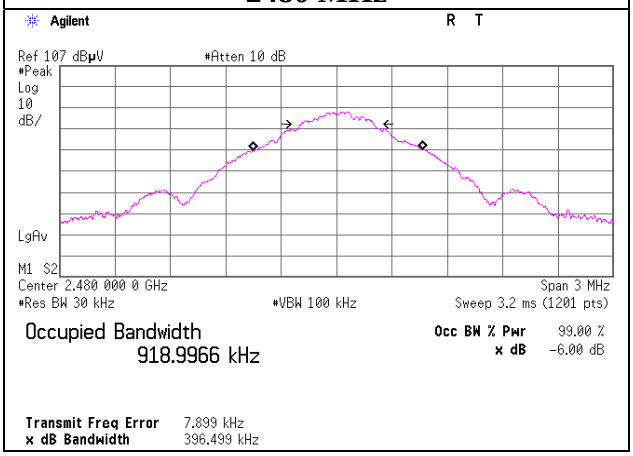
2403 MHz



2440 MHz

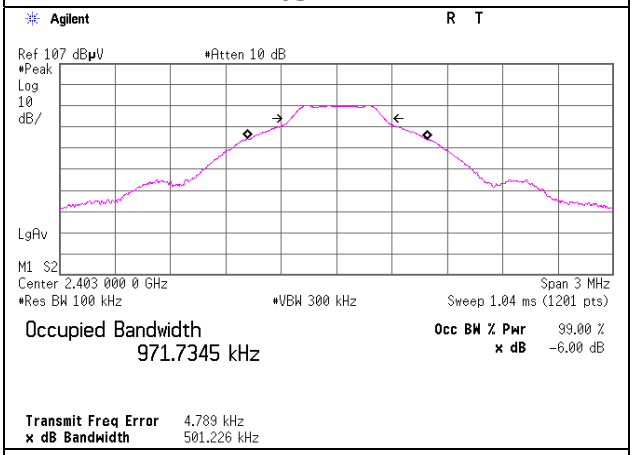


2480 MHz

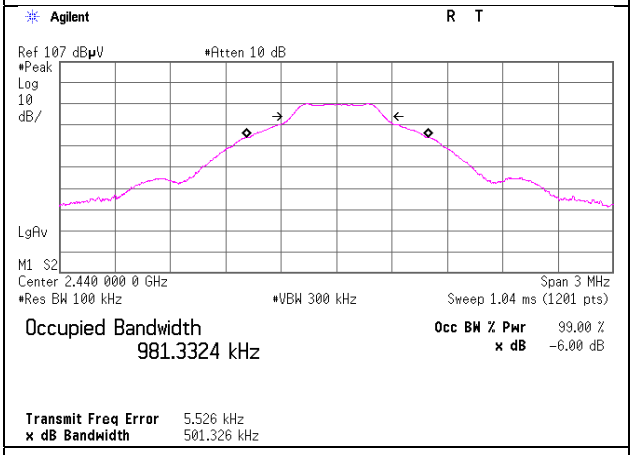


6dB Bandwidth

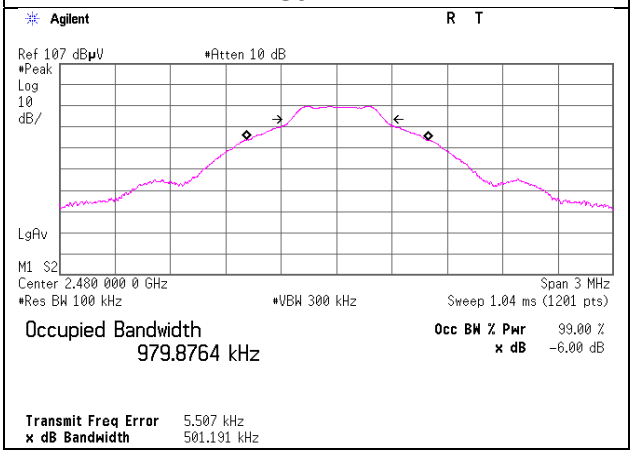
2403 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Report No.	13226743H	
Test place	Ise EMC Lab. No.6 Measurement Room	
Date	March 19, 2020	August 26, 2020
Temperature / Humidity	23 deg. C / 32 % RH	22 deg. C / 48 % RH
Engineer	Yuta Moriya	Junki Nagatomi
Mode	Tx	

Power setting (0dBm)				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]
2403	-11.97	0.00	0.00	-11.97	0.06	30.00	1000	41.97	6.00	-5.97	0.25	36.02	4000	41.99
2440	-12.22	0.00	0.00	-12.22	0.06	30.00	1000	42.22	6.00	-6.22	0.24	36.02	4000	42.24
2480	-12.52	0.00	0.00	-12.52	0.06	30.00	1000	42.52	6.00	-6.52	0.22	36.02	4000	42.54

Power setting (-20dBm)				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]
2403	-31.31	0.28	0.00	-31.03	0.001	30.00	1000	61.03	6.00	-25.03	0.003	36.02	4000	61.05
2440	-30.74	0.29	0.00	-30.45	0.001	30.00	1000	60.45	6.00	-24.45	0.004	36.02	4000	60.47
2480	-31.47	0.29	0.00	-31.18	0.001	30.00	1000	61.18	6.00	-25.18	0.003	36.02	4000	61.20

Sample Calculation:
Result = Reading + Cable Loss + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

Average Output Power
(Reference data for RF Exposure)

Report No.	13226743H	
Test place	Ise EMC Lab. No.6 Measurement Room	
Date	March 19, 2020	August 26, 2020
Temperature / Humidity	23 deg. C / 32 % RH	22 deg. C / 48 % RH
Engineer	Yuta Moriya	Junki Nagatomi
Mode	Tx	

Power setting (0dBm)

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2403	-12.27	0.00	0.00	-12.27	0.06	0.00	-12.27	0.06
2440	-12.55	0.00	0.00	-12.55	0.06	0.00	-12.55	0.06
2480	-12.89	0.00	0.00	-12.89	0.05	0.00	-12.89	0.05

Power setting (-20dBm)

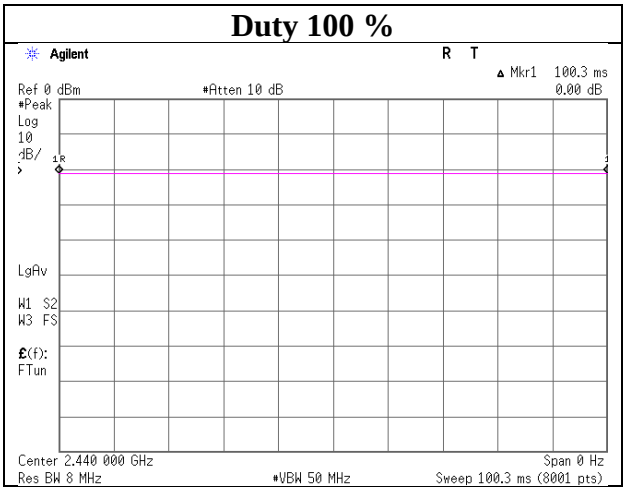
Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2403	-41.64	0.28	9.77	-31.59	0.001	0.00	-31.59	0.001
2440	-41.92	0.29	9.77	-31.86	0.001	0.00	-31.86	0.001
2480	-42.26	0.29	9.77	-32.20	0.001	0.00	-32.20	0.001

Sample Calculation:
Result (Time average) = Reading + Cable Loss + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

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

Burst rate confirmation

Report No.	13226743H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 24, 2020
Temperature / Humidity	24 deg. C / 34 % RH
Engineer	Junki Nagatomi
Mode	Tx



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

Radiated Spurious Emission

Report No.	13226743H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	June 25, 2020	June 26, 2020	June 27, 2020
Temperature / Humidity	23 deg. C / 57 % RH	22 deg. C / 67 % RH	22 deg. C / 67 % RH
Engineer	Yuta Moriya	Junki Nagatomi	Takeshi Hiyaji
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)	Below 1GHz
Mode	Tx 2403 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	216.000	QP	40.0	11.1	9.3	32.0	-	28.3	43.5	15.2	
Hori.	240.000	QP	46.5	11.5	9.5	32.0	-	35.5	46.0	10.5	
Hori.	312.000	QP	46.1	13.8	10.1	32.0	-	38.0	46.0	8.0	
Hori.	336.000	QP	45.1	14.7	10.2	32.0	-	38.1	46.0	7.9	
Hori.	360.000	QP	44.1	15.0	10.4	32.0	-	37.6	46.0	8.4	
Hori.	432.000	QP	36.6	16.2	10.9	32.0	-	31.7	46.0	14.3	
Hori.	2390.000	PK	42.2	27.7	5.4	32.7	-	42.5	73.9	31.4	
Hori.	4806.000	PK	40.4	31.6	7.5	31.7	-	47.8	73.9	26.1	Floor noise
Hori.	9612.000	PK	41.3	38.5	9.4	33.3	-	55.9	73.9	18.0	Floor noise
Hori.	2390.000	AV	34.1	27.7	5.4	32.7	-	34.4	53.9	19.5	
Hori.	4806.000	AV	32.6	31.6	7.5	31.7	-	40.0	53.9	13.9	Floor noise
Hori.	9612.000	AV	33.0	38.5	9.4	33.3	-	47.6	53.9	6.3	Floor noise
Vert.	216.000	QP	40.4	11.1	9.3	32.0	-	28.7	43.5	14.8	
Vert.	240.000	QP	48.1	11.5	9.5	32.0	-	37.1	46.0	8.9	
Vert.	312.000	QP	44.3	13.8	10.1	32.0	-	36.2	46.0	9.8	
Vert.	336.000	QP	43.3	14.7	10.2	32.0	-	36.3	46.0	9.7	
Vert.	360.000	QP	39.5	15.0	10.4	32.0	-	33.0	46.0	13.0	
Vert.	432.000	QP	29.3	16.2	10.9	32.0	-	24.4	46.0	21.6	
Vert.	2390.000	PK	42.5	27.7	5.4	32.7	-	42.9	73.9	31.1	
Vert.	4806.000	PK	39.5	31.6	7.5	31.7	-	47.0	73.9	27.0	Floor noise
Vert.	9612.000	PK	41.2	38.5	9.4	33.3	-	55.8	73.9	18.1	Floor noise
Vert.	2390.000	AV	33.6	27.7	5.4	32.7	-	33.9	53.9	20.0	
Vert.	4806.000	AV	32.6	31.6	7.5	31.7	-	40.0	53.9	13.9	Floor noise
Vert.	9612.000	AV	32.9	38.5	9.4	33.3	-	47.5	53.9	6.4	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

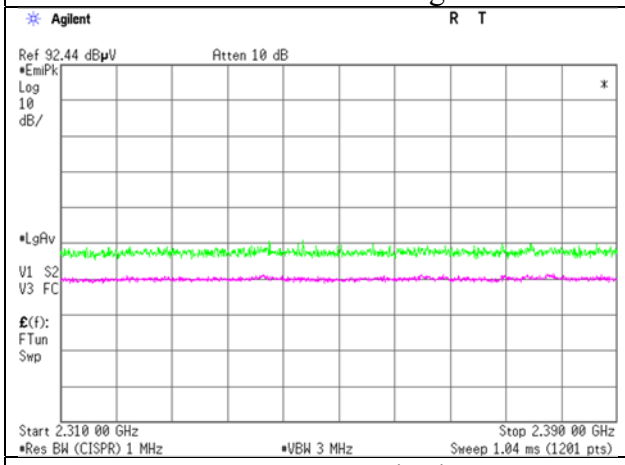
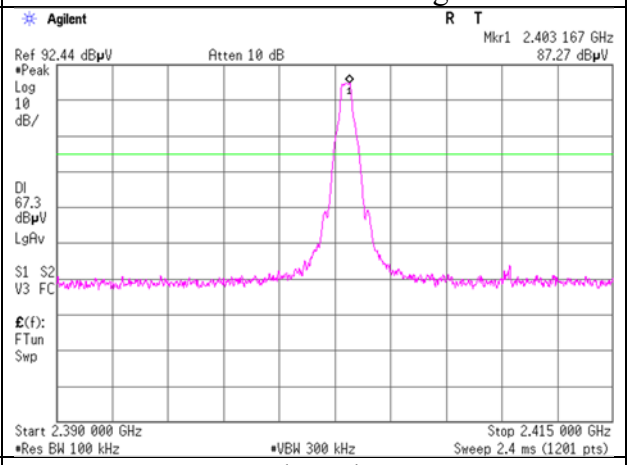
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2403.000	PK	87.3	27.7	5.4	32.7	87.6	-	-	Carrier
Hori.	2400.000	PK	36.5	27.7	5.4	32.7	36.8	67.6	30.8	
Hori.	7209.000	PK	39.3	36.0	8.9	32.6	51.5	67.6	16.1	
Vert.	2403.000	PK	88.0	27.7	5.4	32.7	88.3	-	-	Carrier
Vert.	2400.000	PK	35.3	27.7	5.4	32.7	35.6	68.3	32.7	
Vert.	7209.000	PK	37.3	36.0	8.9	32.6	49.6	68.3	18.7	

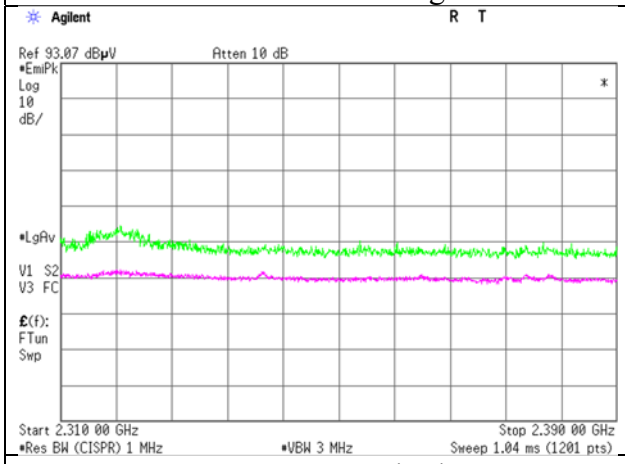
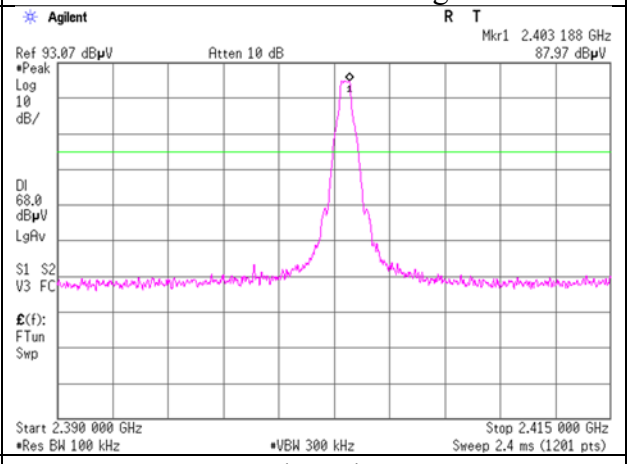
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor: 1 GHz - 10 GHz 20log (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13226743H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 25, 2020
Temperature / Humidity	23 deg. C / 57 % RH
Engineer	Yuta Moriya
	(1 GHz - 10 GHz)
Mode	Tx 2403 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.	13226743H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	June 25, 2020	June 26, 2020	June 27, 2020
Temperature / Humidity	23 deg. C / 57 % RH	22 deg. C / 67 % RH	22 deg. C / 67 % RH
Engineer	Yuta Moriya	Junki Nagatomi	Takeshi Hiyaji
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)	Below 1GHz
Mode	Tx 2440 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	216.000	QP	41.2	11.1	9.3	32.0	-	29.5	43.5	14.0	
Hori.	240.000	QP	46.2	11.5	9.5	32.0	-	35.2	46.0	10.8	
Hori.	312.000	QP	46.3	13.8	10.1	32.0	-	38.2	46.0	7.8	
Hori.	336.000	QP	45.0	14.7	10.2	32.0	-	38.0	46.0	8.0	
Hori.	360.000	QP	44.3	15.0	10.4	32.0	-	37.8	46.0	8.2	
Hori.	480.000	QP	35.7	17.2	11.2	32.0	-	32.1	46.0	13.9	
Hori.	4880.000	PK	39.5	31.5	7.5	31.6	-	46.9	73.9	27.0	Floor noise
Hori.	7320.000	PK	44.2	36.2	8.9	32.6	-	56.6	73.9	17.3	
Hori.	9760.000	PK	41.4	38.8	9.4	33.4	-	56.2	73.9	17.7	Floor noise
Hori.	4880.000	AV	33.1	31.5	7.5	31.6	-	40.5	53.9	13.4	Floor noise
Hori.	7320.000	AV	37.8	36.2	8.9	32.6	-	50.2	53.9	3.7	
Hori.	9760.000	AV	32.9	38.8	9.4	33.4	-	47.7	53.9	6.2	Floor noise
Vert.	216.000	QP	40.6	11.1	9.3	32.0	-	28.9	43.5	14.6	
Vert.	240.000	QP	48.0	11.5	9.5	32.0	-	37.0	46.0	9.0	
Vert.	312.000	QP	44.5	13.8	10.1	32.0	-	36.4	46.0	9.6	
Vert.	336.000	QP	43.6	14.7	10.2	32.0	-	36.6	46.0	9.4	
Vert.	360.000	QP	40.0	15.0	10.4	32.0	-	33.5	46.0	12.5	
Vert.	480.000	QP	33.0	17.2	11.2	32.0	-	29.4	46.0	16.6	
Vert.	4880.000	PK	39.3	31.5	7.5	31.6	-	46.6	73.9	27.3	Floor noise
Vert.	7320.000	PK	43.5	36.2	8.9	32.6	-	56.0	73.9	18.0	
Vert.	9760.000	PK	41.3	38.8	9.4	33.4	-	56.1	73.9	17.8	Floor noise
Vert.	4880.000	AV	33.2	31.5	7.5	31.6	-	40.6	53.9	13.3	Floor noise
Vert.	7320.000	AV	37.3	36.2	8.9	32.6	-	49.7	53.9	4.2	
Vert.	9760.000	AV	32.8	38.8	9.4	33.4	-	47.6	53.9	6.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz 20log (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	13226743H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	June 25, 2020	June 26, 2020	June 27, 2020
Temperature / Humidity	23 deg. C / 57 % RH	22 deg. C / 67 % RH	22 deg. C / 67 % RH
Engineer	Yuta Moriya	Junki Nagatomi	Takeshi Hiyaji
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)	Below 1GHz
Mode	Tx 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	216.000	QP	41.1	11.1	9.3	32.0	-	29.4	43.5	14.1	
Hori.	240.000	QP	46.1	11.5	9.5	32.0	-	35.1	46.0	10.9	
Hori.	312.000	QP	46.0	13.8	10.1	32.0	-	37.9	46.0	8.1	
Hori.	336.000	QP	45.2	14.7	10.2	32.0	-	38.2	46.0	7.8	
Hori.	360.000	QP	44.5	15.0	10.4	32.0	-	38.0	46.0	8.0	
Hori.	660.000	QP	28.9	19.3	12.3	32.0	-	28.5	46.0	17.5	
Hori.	2483.500	PK	42.4	27.5	5.4	32.7	-	42.6	73.9	31.4	
Hori.	4960.000	PK	39.3	31.6	7.5	31.6	-	46.7	73.9	27.2	Floor noise
Hori.	7440.000	PK	44.1	36.3	8.9	32.7	-	56.7	73.9	17.3	
Hori.	9920.000	PK	40.8	38.9	9.4	33.5	-	55.7	73.9	18.2	Floor noise
Hori.	2483.500	AV	34.2	27.5	5.4	32.7	-	34.4	53.9	19.5	
Hori.	4960.000	AV	32.9	31.6	7.5	31.6	-	40.3	53.9	13.6	Floor noise
Hori.	7440.000	AV	37.6	36.3	8.9	32.7	-	50.1	53.9	3.8	
Hori.	9920.000	AV	32.5	38.9	9.4	33.5	-	47.4	53.9	6.5	Floor noise
Vert.	216.000	QP	41.3	11.1	9.3	32.0	-	29.6	43.5	13.9	
Vert.	240.000	QP	48.3	11.5	9.5	32.0	-	37.3	46.0	8.7	
Vert.	312.000	QP	44.4	13.8	10.1	32.0	-	36.3	46.0	9.7	
Vert.	336.000	QP	43.7	14.7	10.2	32.0	-	36.7	46.0	9.3	
Vert.	360.000	QP	40.3	15.0	10.4	32.0	-	33.8	46.0	12.2	
Vert.	660.000	QP	27.5	19.3	12.3	32.0	-	27.1	46.0	18.9	
Vert.	2483.500	PK	43.2	27.5	5.4	32.7	-	43.4	73.9	30.5	
Vert.	4960.000	PK	39.8	31.6	7.5	31.6	-	47.2	73.9	26.7	Floor noise
Vert.	7440.000	PK	43.6	36.3	8.9	32.7	-	56.1	73.9	17.8	
Vert.	9920.000	PK	40.7	38.9	9.4	33.5	-	55.6	73.9	18.3	Floor noise
Vert.	2483.500	AV	34.6	27.5	5.4	32.7	-	34.8	53.9	19.1	
Vert.	4960.000	AV	33.0	31.6	7.5	31.6	-	40.4	53.9	13.5	Floor noise
Vert.	7440.000	AV	36.9	36.3	8.9	32.7	-	49.4	53.9	4.5	
Vert.	9920.000	AV	32.4	38.9	9.4	33.5	-	47.3	53.9	6.6	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

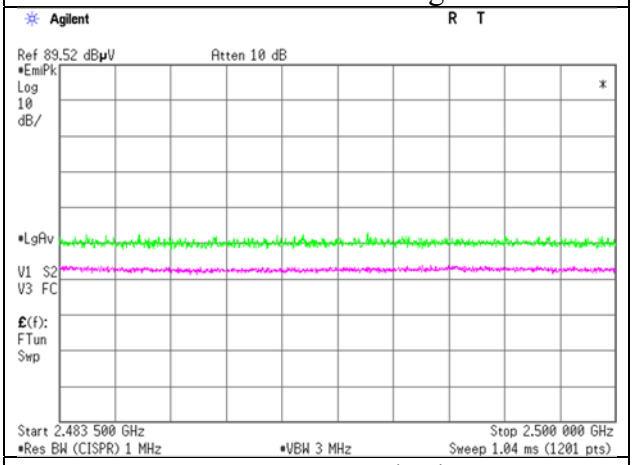
Distance factor: 1 GHz - 10 GHz 20log (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13226743H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 25, 2020
Temperature / Humidity	23 deg. C / 57 % RH
Engineer	Yuta Moriya
	(1 GHz - 10 GHz)
Mode	Tx 2480 MHz

Horizontal

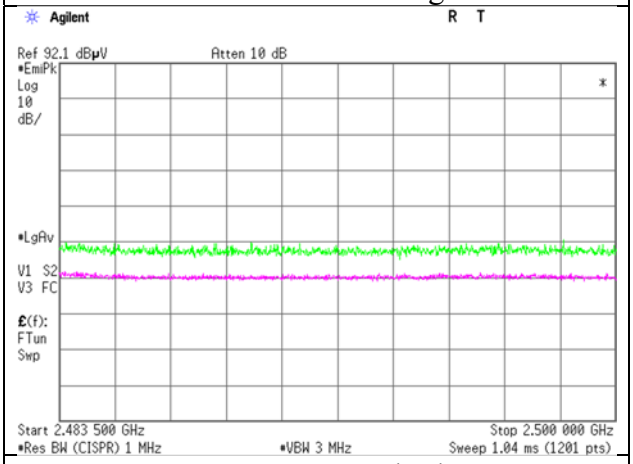
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

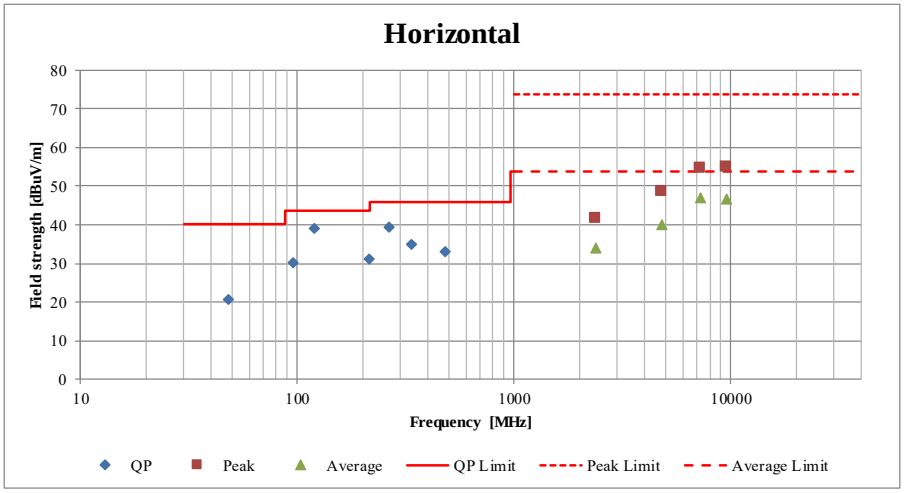


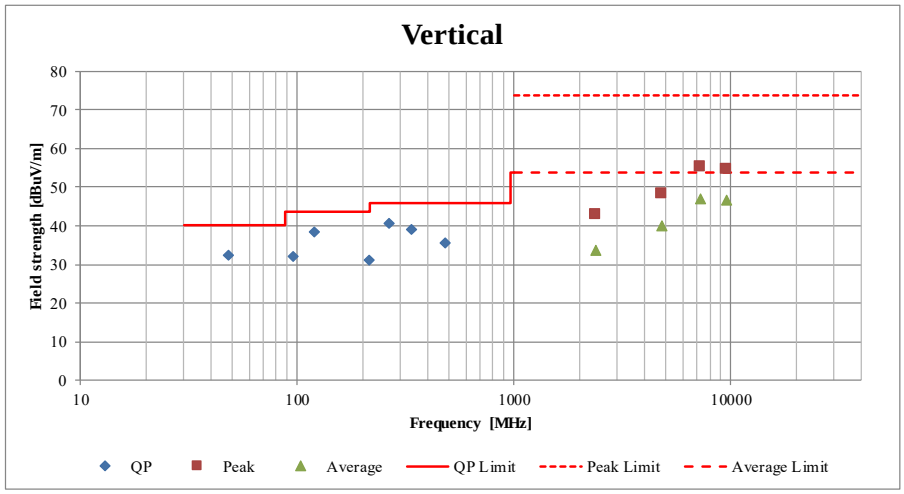
Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.	13226743H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	June 25, 2020	June 26, 2020	June 27, 2020
Temperature / Humidity	23 deg. C / 57 % RH	22 deg. C / 67 % RH	22 deg. C / 67 % RH
Engineer	Yuta Moriya (1 GHz - 10 GHz)	Junki Nagatomi (10 GHz - 26.5 GHz)	Takeshi Hiyaji Below 1GHz
Mode	Tx 2403 MHz		



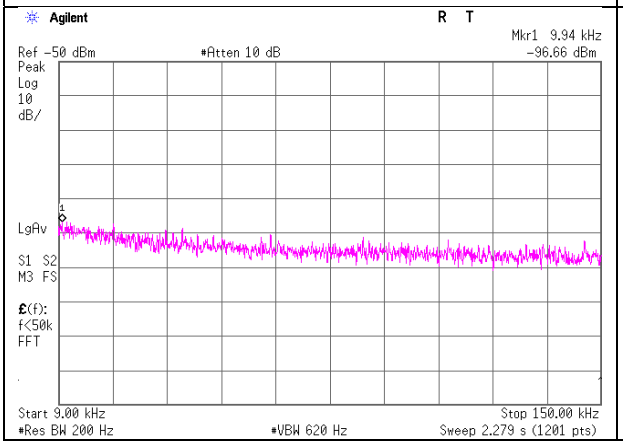


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

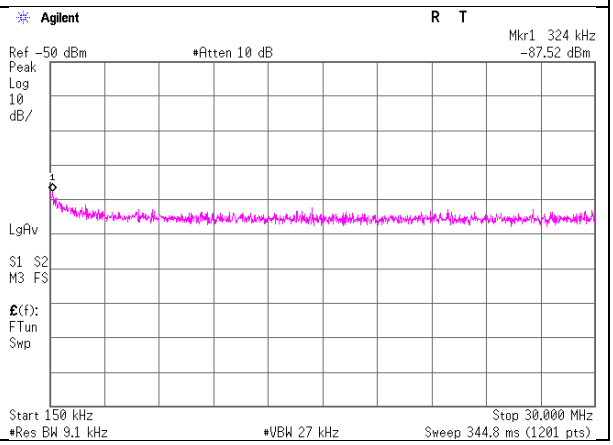
Conducted Spurious Emission

Report No.	13226743H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 19, 2020
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Yuta Moriya
Mode	Tx 2403 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
9.94	-96.7	0.00	9.9	6.0	1	-80.8	300	6.0	-19.5	47.6	67.1	
324.00	-87.5	0.01	9.9	6.0	1	-71.7	300	6.0	-10.4	17.3	27.7	

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

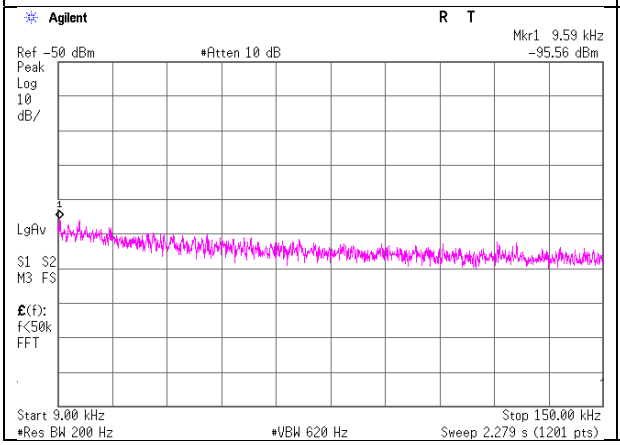
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

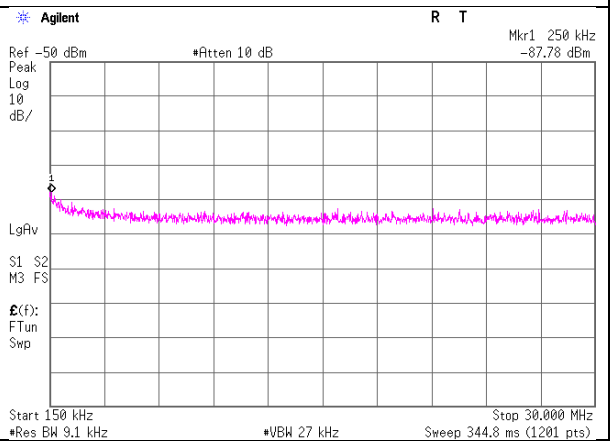
Conducted Spurious Emission

Report No.	13226743H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 19, 2020
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Yuta Moriya
Mode	Tx 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
9.59	-95.6	0.00	9.9	6.0	1	-79.7	300	6.0	-18.4	47.9	66.3	
250.00	-87.8	0.01	9.9	6.0	1	-71.9	300	6.0	-10.7	19.6	30.3	

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

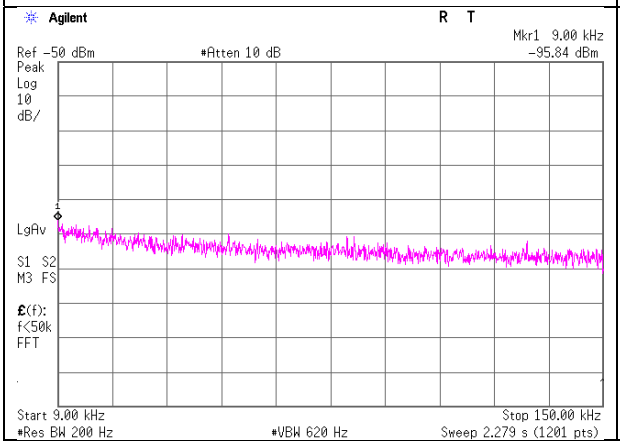
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

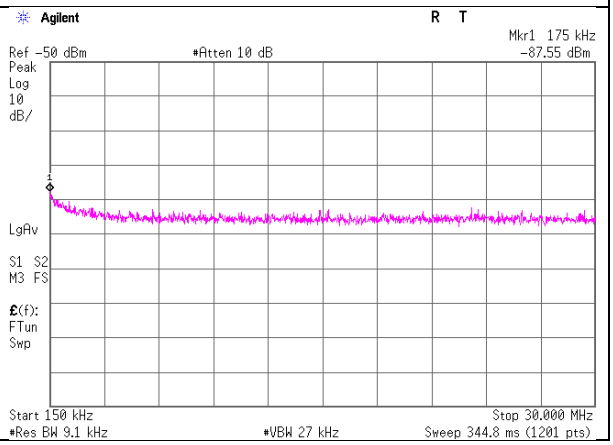
Conducted Spurious Emission

Report No.	13226743H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	March 19, 2020
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Yuta Moriya
Mode	Tx 2403 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
9.00	-95.8	0.00	9.9	6.0	1	-80.0	300	6.0	-18.7	48.5	67.2	
175.00	-87.6	0.01	9.9	6.0	1	-71.7	300	6.0	-10.4	22.7	33.1	

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

Power Density

Report No.	13226743H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 30, 2020
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Yuta Moriya
Mode	Tx

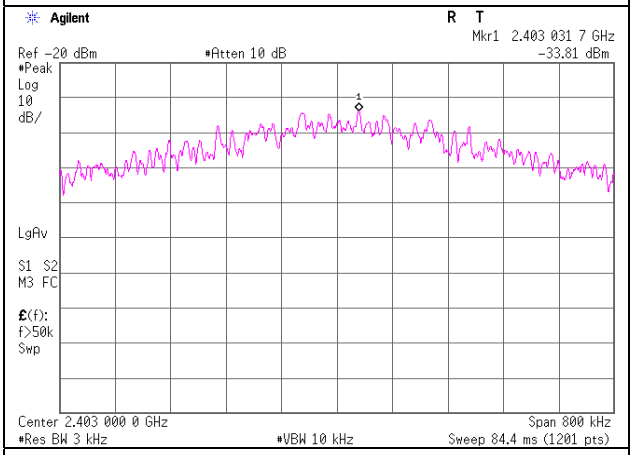
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2403	-33.81	1.29	9.73	-22.79	8.00	30.79
2440	-34.09	1.30	9.73	-23.06	8.00	31.06
2480	-34.49	1.31	9.73	-23.45	8.00	31.45

Sample Calculation:
Result = Reading + Cable Loss + Attenuator Loss

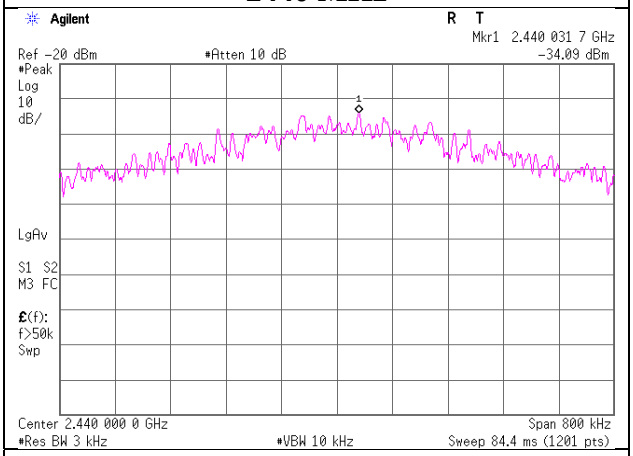
*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density

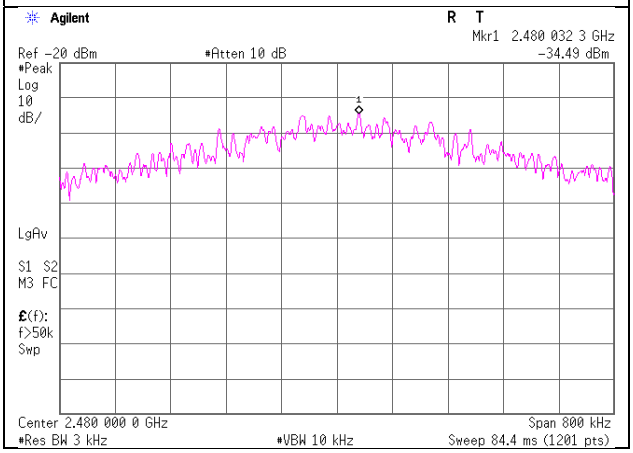
2403 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	MSA-04	141885	Spectrum Analyzer	Keysight Technologies Inc	E4448A	US44300523	2019/11/21	12
AT	MPM-01	141801	Power Meter	Keysight Technologies Inc	E4417A	GB41290639	2020/04/07	12
AT	MPSE-03	141837	Power sensor	Keysight Technologies Inc	E9327A	US40440576	2020/04/07	12
AT	MCC-177	141226	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S304	2020/03/18	12
AT	MAT-92	141421	Attenuator	Weinschel Associates	WA56-10	56100308	2020/05/25	12
AT	MOS-14	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	2020/01/07	12
AT	MAT-10	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	2019/11/07	12
RE	MSA-10	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	2019/08/07	12
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM	CTH-201	1301	2020/01/07	12
RE	MMM-08	141532	DIGITAL HiTESTER	Hioki	3805	51201197	2020/01/06	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	2019/04/08	24
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	258	2019/09/26	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	2020/03/24	12
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/1902S579(5m)	2020/03/02	12
RE	MHF-25	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	2019/09/11	12
RE	MHA-02	141503	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	2020/06/15	12
RE	MAT-95	142314	Attenuator	Pasternack	PE7390-6	D/C 1504	2020/06/17	12
RE	MBA-03	141424	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	1915	2019/08/24	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	2020/07/06	12
RE	MLA-22	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-191	2019/08/24	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	2020/02/10	12
RE/CE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	2020/03/10	12
RE/CE	MAEC-04	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	2020/05/25	24
RE/CE	MOS-15	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	2020/01/07	12
RE/CE	MMM-10	141545	DIGITAL HiTESTER	Hioki	3805	51201148	2020/01/06	12
RE/CE	MJM-26	142227	Measure	KOMELON	KMC-36	-	-	-
RE/CE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
CE	MLS-23	141357	LISN(AMN)	Schwarzbeck Mess - Elektronik	NSLK8127	8127-729	2019/07/05	12
CE	MLS-24	141358	LISN(AMN)	Schwarzbeck Mess - Elektronik	NSLK8127	8127-730	2019/07/05	12
CE	MTA-52	141934	Terminator	TME	CT-01BP	-	2019/12/02	12
CE	MAT-67	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	2019/12/02	12
CE	MCC-112	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/sucoform141-PE/421-010/RFM-E321(SW)	-/00640	2020/07/06	12
AT	MSA-14	141901	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY48250080	2019/10/06	12
AT	MAT-88	141312	Attenuator	Weinschel Associates	WA56-10	56100304	2020/05/27	12
AT	MCC-138	141410	Microwave cable	Huber+Suhner	SUCOFLEX 102	37953/2	2019/09/18	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: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test