RADIO TEST REPORT

Test Report No. : 12865562H-A-R2

Applicant	:	**Roland Corporation**
Type of Equipment	:	**Wireless Transmitter**
Model No.	:	**WL-T(2)**
FCC ID	:	**SOP420321B**
Test regulation	:	**FCC Part 15 Subpart C: 2019**
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 above regulation.
4. The test results in this 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 Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12865562H-A-R1. 12865562H-A-R1 is replaced with this report.

Date of test: October 25 to November 14, 2019

Representative test engineer:
Yuta Moriya
Engineer
Consumer Technology Division

Approved by:
Tsubasa Takayama
Leader
Consumer Technology Division

NVLAP TESTING NVLAP LAB CODE 200572-0 ilac-MRA

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☒ There is no testing item of "Non-accreditation".

REVISION HISTORY

Original Test Report No.: 12865562H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12865562H-A	November 27, 2019	-	-
1	12865562H-A-R1	December 19, 2019	P 6	Addition of explanatory note for FCC15B.
1	12865562H-A-R1	December 19, 2019	P 6	Addition of explanatory note *1) for Conducted Emission test in Clause 3.2.
1	12865562H-A-R1	December 19, 2019	P 6	Correction of unit of frequency for worst margin of spurious emission restricted band Edges in Clause 3.2 : From 2568.023 MH to 2568.023 MHz
1	12865562H-A-R1	December 19, 2019	P 9	Correction of explanatory note for Maximum Peak Output Power. : From Mid Channel to High Channel
1	12865562H-A-R1	December 19, 2019	P 10	Addition of cable length for RE*Above 1GHz in Clause 4.2
1	12865562H-A-R1	December 19, 2019	P 13	Correction of Test Volume in Figure 2 of SECTION 6. : From 2.0 m to 1.5 m
1	12865562H-A-R1	December 19, 2019	P 28	Correction of Mode in APPENDIX 1. : From Tx 11g 2462 MHz to Tx 2462 MHz
2	12865562H-A-R2	December 20, 2019	P 9	Addition of below explanatory note * in Clause 4.1. * The tests were performed using a test tool that output on a single frequency (without frequency switching) at the max duty cycle.
2	12865562H-A-R2	December 20, 2019	P 28	Correction of Mode in APPENDIX 1. : From Tx 2462 MHz to Tx 2478 MHz

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	:	Roland Corporation
Address	:	1-5-3 Shinmiyakoda, Kita-ku, Hamamatsu, Shizuoka 431-1304 Japan
Telephone Number	:	+81-53-428-5095
Facsimile Number	:	+81-53-428-5097
Contact Person	:	Hisashi Ninomiya

The information provided from the customer is as follows;
- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless Transmitter
Model No.	:	WL-T(2)
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 3.7 V
Receipt Date of Sample (Information from test lab.)	:	October 25, 2019
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: WL-T(2) (referred to as the EUT in this report) is a Wireless Transmitter.

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	2402 MHz - 2478 MHz
Modulation	:	GFSK
Antenna type	:	Pattern Antenna
Antenna Gain	:	3.0 dBi
Clock frequency (Maximum)	:	32 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

Title : FCC 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 customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	23.74 dB, 0.69080 MHz, AV, L	Complied a)	*1)
	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)	0.3 dB 2568.023 MHz, AV, Horizontal	Complied# e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
	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) The radio communication function does not work while charging in actual use.The conducted emission test was performed as a reference since the radio communication function is active in the test mode.
*2) 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)
The EUT is a battery-operated device and test was performed with the full-charged battery. Therefore, this EUT complies with the requirement.

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	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.

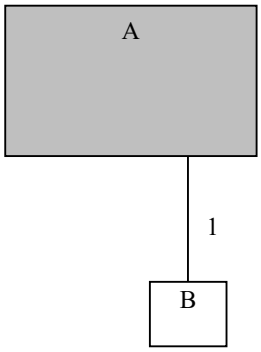
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

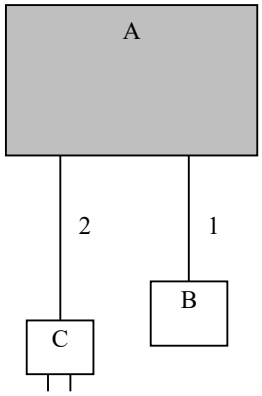
Mode	Remarks*
Transmitting (Tx) mode	2402 MHz 2440 MHz 2478 MHz
*The worst condition was determined based on the test result of Maximum Peak Output Power (High Channel)	
*Power of the EUT was set by the software as follows; Power settings: -4dBm (This power setting corresponds to the value before connecting to the amplifier.) Software: TX_WLT, 20191024_TX_WLT_BLD19 *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 tests were performed using a test tool that output on a single frequency (without frequency switching) at the max duty cycle	

4.2 Configuration and peripherals

< Radiated Spurious Emission test>



< All tests except for Radiated Spurious Emission test>



AC 120 V / 60 Hz

* 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 Transmitter	WL-T(2)	007#	Roland Corporation	EUT
B	iPod touch	MKJ22J/A	CCQV734HGGNM	Apple	-
C	AC Adaptor	S008VU0500160	068170Z51802272 AE	BOSE	for CE* only

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.1 for other tests 1.6 for RE*Above 1GHz	Shielded	Shielded	-
2	USB Cable	1.0 for CE* only	Shielded	Shielded	-

*RE: Radiated Spurious Emission test, CE: Conducted Emission test

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.

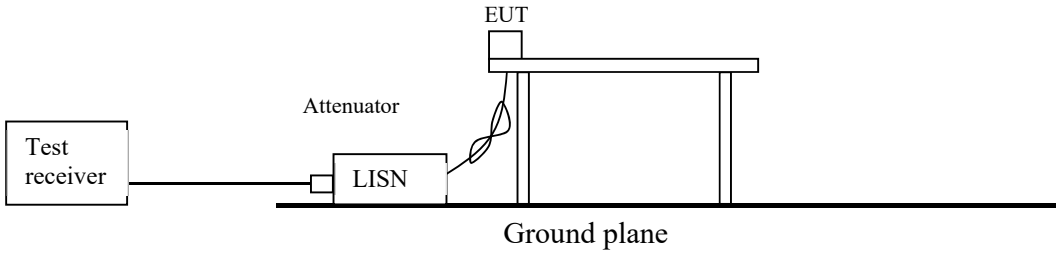
1) For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (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.

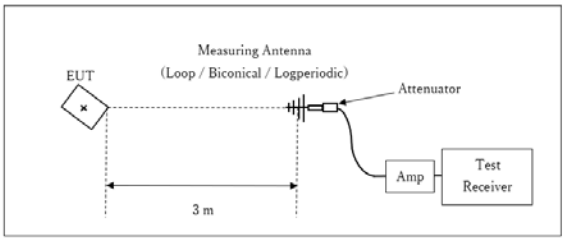
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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	RBW: 100 kHz VBW: 300 kHz

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

Figure 2: Test Setup

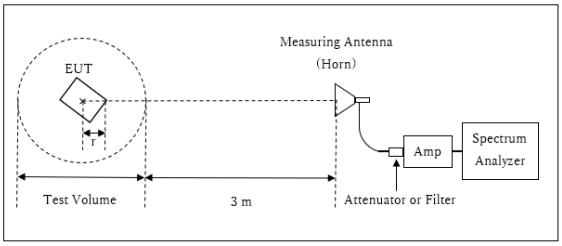
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

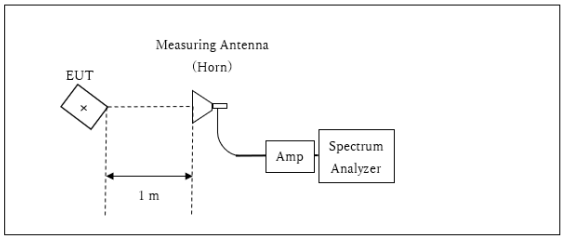


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.75 m / 3.0 m) = 1.94 dB
* Test Distance: (3 + Test Volume /2) - r = 3.75 m

Test Volume : 1.5 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0 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.

*Charging and non-charging states were confirmed in pre-check and the test was performed with the worst case condition.

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)	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.
① 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)

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.

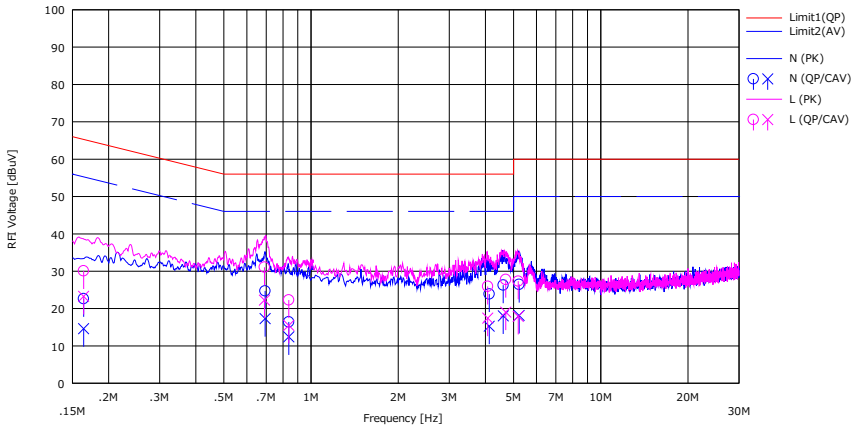
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Date	November 14, 2019
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Junya Okuno
Mode	Tx 2478 MHz

Limit : FCC_Part 15 Subpart C(15.207)



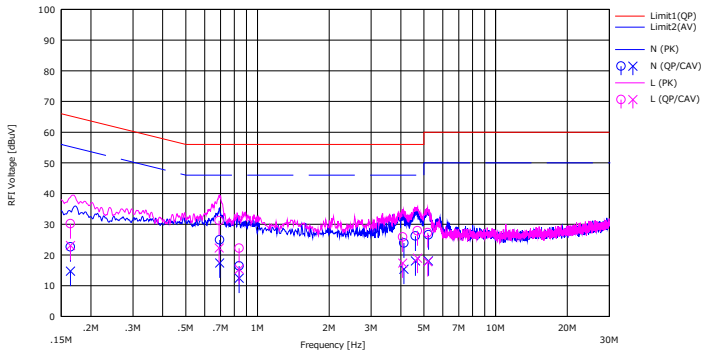
No.	Freq.	Reading ⟨QP⟩	Reading ⟨CAV⟩	LISN	LOSS	Results ⟨QP⟩	Results ⟨CAV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.16400	9.10	1.10	0.15	13.38	22.63	14.63	65.30	55.30	42.67	40.67	N	
2	0.69421	11.10	3.70	0.17	13.43	24.70	17.30	56.00	46.00	31.30	28.70	N	
3	0.83803	2.80	-1.20	0.18	13.44	16.42	12.42	56.00	46.00	39.58	33.58	N	
4	4.12132	9.80	1.20	0.43	13.64	23.87	15.27	56.00	46.00	32.13	30.73	N	
5	4.60600	12.10	3.90	0.49	13.66	26.25	18.05	56.00	46.00	29.75	27.95	N	
6	5.22606	12.20	3.90	0.56	13.69	26.45	18.15	60.00	50.00	33.55	31.85	N	
7	0.16400	16.50	9.70	0.20	13.38	30.08	23.28	65.30	55.30	35.22	32.02	L	
8	0.69080	17.40	8.60	0.23	13.43	31.06	22.26	56.00	46.00	24.94	23.74	L	
9	0.83803	8.60	1.80	0.24	13.44	22.28	15.48	56.00	46.00	33.72	30.52	L	
10	4.07287	11.80	3.30	0.50	13.64	25.94	17.44	56.00	46.00	30.06	28.56	L	
11	4.70001	13.50	4.80	0.57	13.67	27.74	19.04	56.00	46.00	28.26	26.96	L	
12	5.18820	13.00	3.60	0.63	13.69	27.32	17.92	60.00	50.00	32.68	32.08	L	

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

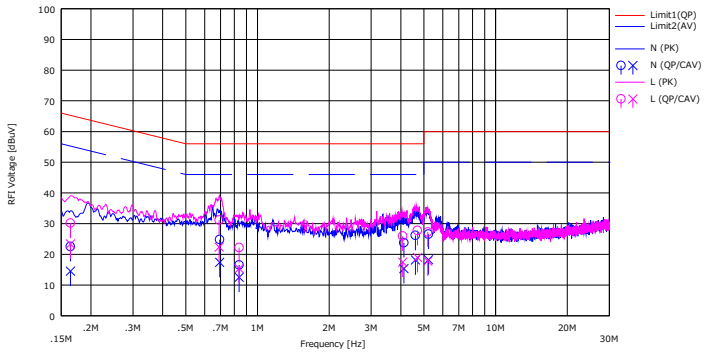
Conducted Emission

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Date	November 14, 2019
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Junya Okuno
Mode	Tx

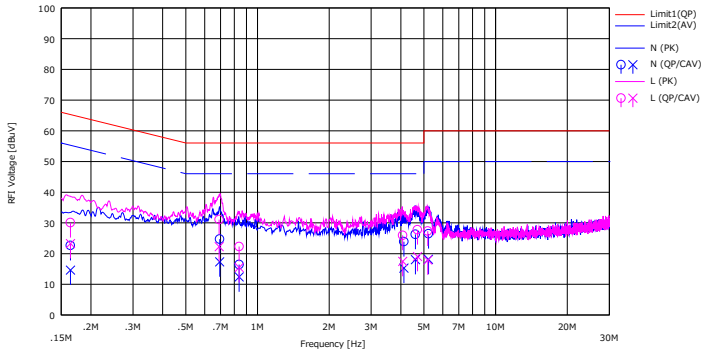
2402 MHz



2440 MHz



2478 MHz



Y scale [dBuV]

Chart — N — L

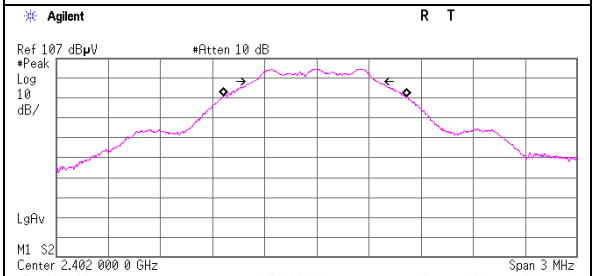
6 dB Bandwidth and 99 % Occupied Bandwidth

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	November 5, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Yuta Moriya
Mode	Tx

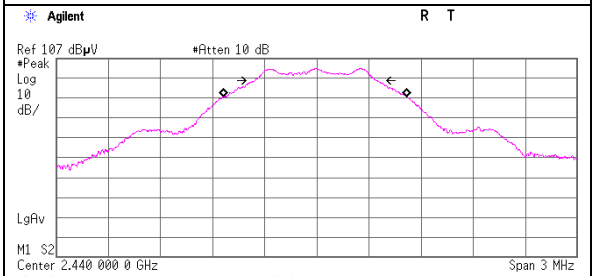
Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
2402	986.7	0.701	> 0.5000
2440	988.7	0.707	> 0.5000
2478	998.8	0.705	> 0.5000

6dB Bandwidth

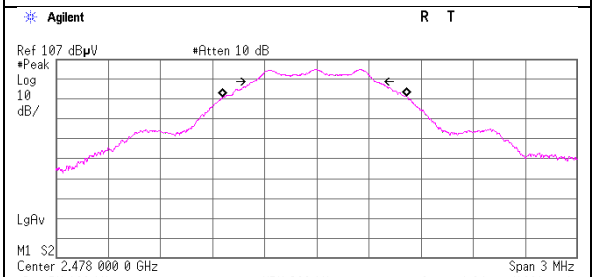
2402 MHz



2440 MHz

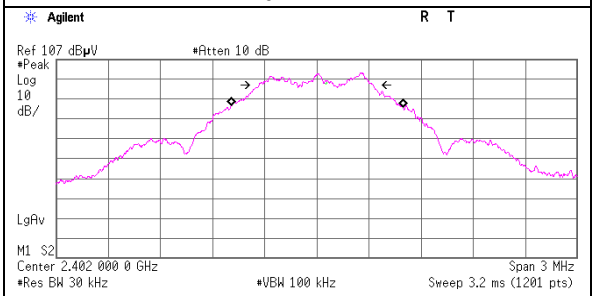


2478 MHz



99%Occupied Bandwidth

2402 MHz

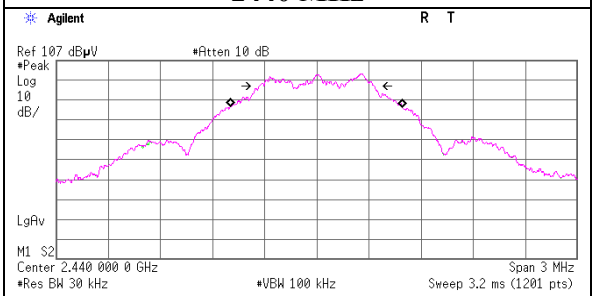


Occupied Bandwidth
986.7130 kHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error 639.049 Hz
x dB Bandwidth 660.039 kHz

2440 MHz

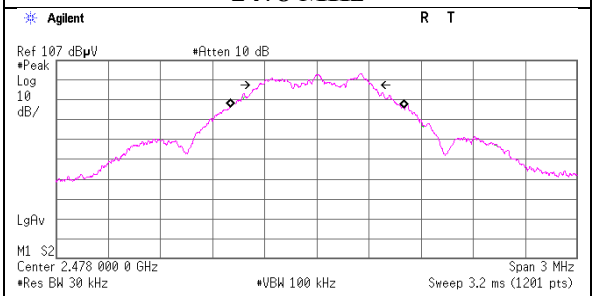


Occupied Bandwidth
988.7101 kHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error -3.674 kHz
x dB Bandwidth 659.812 kHz

2478 MHz



Occupied Bandwidth
998.7796 kHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error 2.892 kHz
x dB Bandwidth 655.588 kHz

Maximum Peak Output Power

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	November 5, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Yuta Moriya
Mode	Tx

				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	-5.46	0.40	10.06	5.00	3.16	30.00	1000	25.01	3.00	8.00	6.30	36.02	4000	28.03
2440	-5.22	0.42	10.06	5.26	3.36	30.00	1000	24.74	3.00	8.26	6.70	36.02	4000	27.76
2478	-5.10	0.43	10.06	5.39	3.46	30.00	1000	24.61	3.00	8.39	6.90	36.02	4000	27.63

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

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	November 5, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Yuta Moriya
Mode	Tx

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	-6.21	0.40	10.06	4.25	2.66	0.52	4.77	3.00
2440	-6.01	0.42	10.06	4.47	2.80	0.52	4.99	3.16
2478	-5.88	0.43	10.06	4.61	2.89	0.52	5.13	3.26

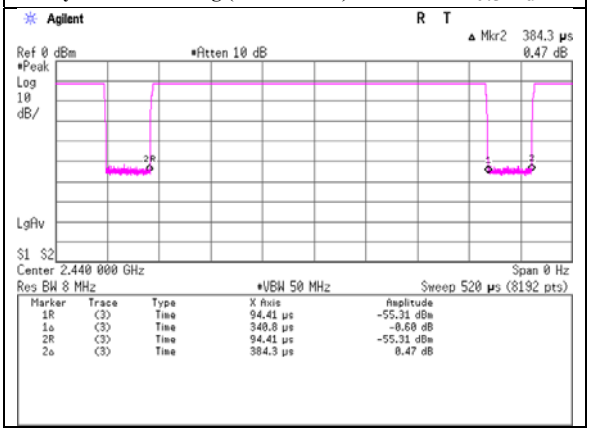
Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

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

Burst rate confirmation

Report No.	12865562H
Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Date	October 27, 2019
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Takafumi Noguchi
Mode	Tx

Tx on / (Tx on + Tx off) =	**0.887**
Tx on / (Tx on + Tx off) * 100 =	**88.7 %**
Duty factor = 10 * log (384.3 / 340.8) =	**0.52 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.	12865562H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	October 25, 2019	October 27, 2019	October 28, 2019
Temperature / Humidity	22 deg. C / 54 % RH	22 deg. C / 54 % RH	22 deg. C / 42 % RH
Engineer	Junya Okuno	Takafumi Noguchi	Yuta Moriya
	(1 GHz - 10 GHz)	(10 GHz-26.5 GHz)	Below 1 GHz
Mode	Tx 2402 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.	31.680	QP	29.1	17.8	7.0	30.5	-	23.5	40.0	16.5	
Hori.	66.263	QP	25.5	6.6	7.6	30.3	-	9.4	40.0	30.6	
Hori.	125.754	QP	23.5	13.4	8.3	30.1	-	15.1	43.5	28.4	
Hori.	272.638	QP	22.9	13.0	9.6	29.2	-	16.3	46.0	29.7	
Hori.	466.152	QP	23.3	16.8	10.9	29.9	-	21.0	46.0	25.0	
Hori.	858.980	QP	21.7	21.5	12.8	28.6	-	27.4	46.0	18.6	
Hori.	2338.037	PK	48.6	27.8	5.2	34.3	-	47.3	73.9	26.6	
Hori.	2390.000	PK	45.3	27.6	5.3	34.3	-	43.9	73.9	30.0	
Hori.	2530.033	PK	56.0	27.5	5.4	34.2	-	54.6	73.9	19.3	
Hori.	4804.000	PK	43.4	31.6	7.5	33.5	-	49.1	73.9	24.8	
Hori.	7206.000	PK	41.8	36.1	8.7	33.4	-	53.1	73.9	20.8	Floor noise
Hori.	9608.000	PK	41.7	38.6	9.3	33.8	-	55.7	73.9	18.2	Floor noise
Hori.	2338.037	AV	42.9	27.8	5.2	34.3	0.5	42.2	53.9	11.7	
Hori.	2390.000	AV	34.3	27.6	5.3	34.3	0.5	33.4	53.9	20.5	*1)
Hori.	2530.033	AV	52.3	27.5	5.4	34.2	0.5	51.4	53.9	2.5	
Hori.	4804.000	AV	34.6	31.6	7.5	33.5	0.5	40.8	53.9	13.1	
Hori.	7206.000	AV	32.7	36.1	8.7	33.4	-	44.0	53.9	9.9	Floor noise
Hori.	9608.000	AV	32.6	38.6	9.3	33.8	-	46.6	53.9	7.3	Floor noise
Vert.	31.680	QP	32.4	17.8	7.0	30.5	-	26.8	40.0	13.2	
Vert.	70.673	QP	26.6	6.3	7.6	30.3	-	10.2	40.0	29.8	
Vert.	124.427	QP	29.3	13.4	8.3	30.1	-	20.9	43.5	22.6	
Vert.	272.638	QP	23.0	13.0	9.6	29.2	-	16.4	46.0	29.6	
Vert.	466.152	QP	23.3	16.8	10.9	29.9	-	21.0	46.0	25.0	
Vert.	858.980	QP	21.8	21.5	12.8	28.6	-	27.5	46.0	18.5	
Vert.	2338.037	PK	48.3	27.8	5.2	34.3	-	47.0	73.9	26.9	
Vert.	2390.000	PK	44.8	27.6	5.3	34.3	-	43.4	73.9	30.5	
Vert.	2530.033	PK	57.3	27.5	5.4	34.2	-	55.9	73.9	18.0	
Vert.	4804.000	PK	43.6	31.6	7.5	33.5	-	49.3	73.9	24.6	
Vert.	7206.000	PK	41.7	36.1	8.7	33.4	-	53.0	73.9	20.9	Floor noise
Vert.	9608.000	PK	41.7	38.6	9.3	33.8	-	55.8	73.9	18.2	Floor noise
Vert.	2338.037	AV	41.8	27.8	5.2	34.3	0.5	41.0	53.9	12.9	
Vert.	2390.000	AV	34.1	27.6	5.3	34.3	0.5	33.2	53.9	20.7	*1)
Vert.	2530.033	AV	50.9	27.5	5.4	34.2	0.5	50.0	53.9	3.9	
Vert.	4804.000	AV	34.5	31.6	7.5	33.5	0.5	40.7	53.9	13.2	
Vert.	7206.000	AV	32.6	36.1	8.7	33.4	-	44.0	53.9	10.0	Floor noise
Vert.	9608.000	AV	32.6	38.6	9.3	33.8	-	46.6	53.9	7.3	Floor noise

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

*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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

*1) Not Out of Band emission(Leakage Power)

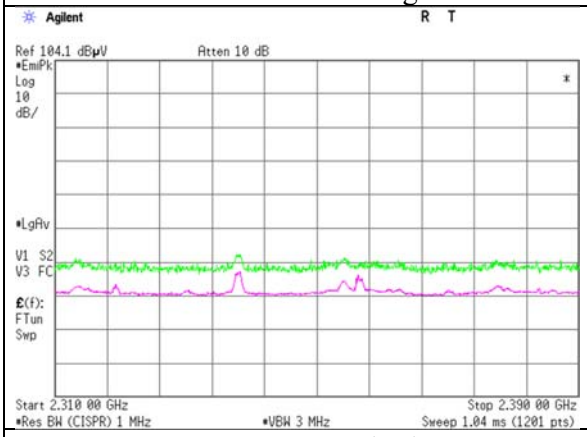
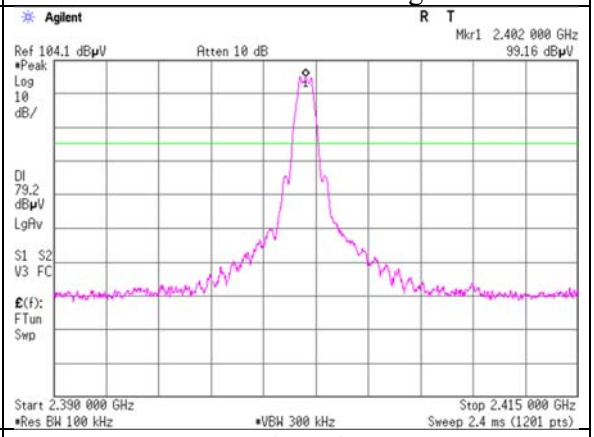
20dBc Data Sheet

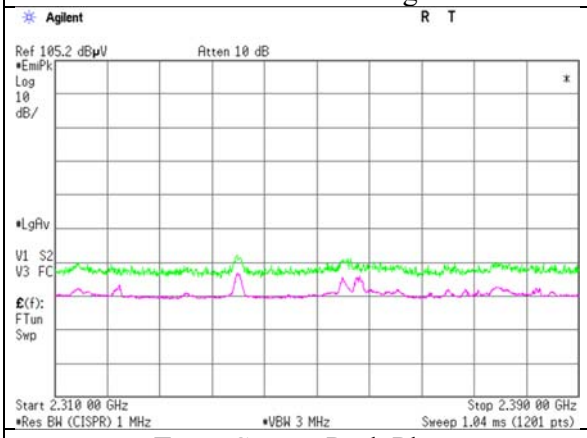
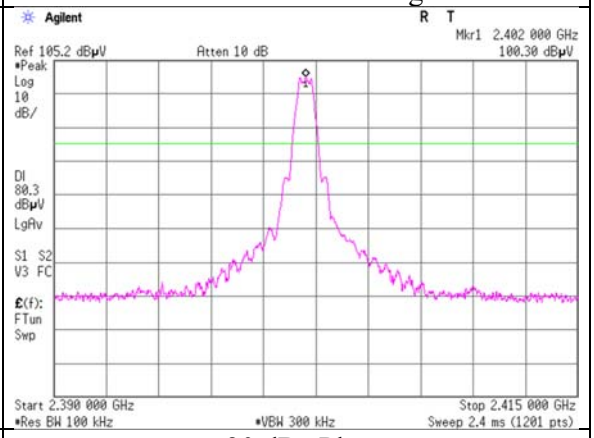
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	99.2	27.6	5.3	34.3	97.7	-	-	Carrier
Hori.	2400.000	PK	49.1	27.6	5.3	34.3	47.7	77.7	30.1	
Vert.	2402.000	PK	100.3	27.6	5.3	34.3	98.9	-	-	Carrier
Vert.	2400.000	PK	50.4	27.6	5.3	34.3	48.9	78.9	29.9	

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12865562H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	October 25, 2019
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Junya Okuno
	(1 GHz - 10 GHz)
Mode	Tx GFSK 2402 MHz

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

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20 dBc 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.	12865562H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 5, 2019	October 27, 2019	October 28, 2019
Temperature / Humidity	23 deg. C / 54 % RH	22 deg. C / 54 % RH	22 deg. C / 42 % RH
Engineer	Yuta Moriya	Takafumi Noguchi	Yuta Moriya
	(1 GHz - 10 GHz)	(10 GHz-26.5 GHz)	Below 1 GHz
Mode	Tx GFSK 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.	32.044	QP	28.9	17.6	7.0	30.5	-	23.1	40.0	16.9	
Hori.	73.949	QP	25.0	6.3	7.7	30.3	-	8.7	40.0	31.3	
Hori.	124.530	QP	25.7	13.4	8.3	30.1	-	17.3	43.5	26.2	
Hori.	277.522	QP	22.6	13.2	9.6	29.2	-	16.2	46.0	29.8	
Hori.	459.554	QP	23.5	16.7	10.8	29.9	-	21.1	46.0	24.9	
Hori.	851.746	QP	21.5	21.3	12.7	28.6	-	26.9	46.0	19.1	
Hori.	2311.975	PK	48.8	28.0	4.9	32.8	-	48.9	73.9	25.0	
Hori.	2568.023	PK	56.4	27.6	5.0	32.7	-	56.3	73.9	17.6	
Hori.	4880.000	PK	42.8	31.6	7.5	33.5	-	48.4	73.9	25.5	
Hori.	7320.000	PK	41.5	36.1	8.8	33.5	-	52.9	73.9	21.1	Floor noise
Hori.	9760.000	PK	41.9	39.2	9.3	33.8	-	56.6	73.9	17.3	Floor noise
Hori.	2311.975	AV	43.3	28.0	4.9	32.8	0.5	43.9	53.9	10.0	
Hori.	2568.023	AV	53.2	27.6	5.0	32.7	0.5	53.6	53.9	0.3	
Hori.	4880.000	AV	36.1	31.6	7.5	33.5	0.5	42.1	53.9	11.8	
Hori.	7320.000	AV	34.4	36.1	8.8	33.5	-	45.8	53.9	8.1	Floor noise
Hori.	9760.000	AV	32.8	39.2	9.3	33.8	-	47.5	53.9	6.4	Floor noise
Vert.	32.944	QP	33.4	17.5	7.1	30.5	-	27.5	40.0	12.5	
Vert.	73.473	QP	26.8	6.3	7.7	30.3	-	10.5	40.0	29.5	
Vert.	125.262	QP	27.2	13.4	8.3	30.1	-	18.8	43.5	24.7	
Vert.	277.522	QP	23.0	13.2	9.6	29.2	-	16.6	46.0	29.4	
Vert.	459.554	QP	23.4	16.7	10.8	29.9	-	21.0	46.0	25.0	
Vert.	851.746	QP	21.7	21.3	12.7	28.6	-	27.1	46.0	18.9	
Vert.	2311.975	PK	48.2	28.0	4.9	32.8	-	48.3	73.9	25.7	
Vert.	2568.023	PK	56.2	27.6	5.0	32.7	-	56.1	73.9	17.8	
Vert.	4880.000	PK	42.6	31.6	7.5	33.5	-	48.1	73.9	25.8	
Vert.	7320.000	PK	41.7	36.1	8.8	33.5	-	53.1	73.9	20.9	Floor noise
Vert.	9760.000	PK	41.8	39.2	9.3	33.8	-	56.5	73.9	17.4	Floor noise
Vert.	2311.975	AV	42.9	28.0	4.9	32.8	0.5	43.5	53.9	10.4	
Vert.	2568.023	AV	52.8	27.6	5.0	32.7	0.5	53.3	53.9	0.6	
Vert.	4880.000	AV	35.5	31.6	7.5	33.5	0.5	41.6	53.9	12.3	
Vert.	7320.000	AV	34.2	36.1	8.8	33.5	-	45.6	53.9	8.3	Floor noise
Vert.	9760.000	AV	32.9	39.2	9.3	33.8	-	47.6	53.9	6.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	12865562H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	October 25, 2019	October 27, 2019	October 28, 2019
Temperature / Humidity	22 deg. C / 54 % RH	22 deg. C / 54 % RH	22 deg. C / 42 % RH
Engineer	Junya Okuno	Takafumi Noguchi	Yuta Moriya
	(1 GHz - 10 GHz)	(10 GHz-26.5 GHz)	Below 1 GHz
Mode	Tx GFSK 2478 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.	32.522	QP	28.5	17.6	7.0	30.5	-	22.7	40.0	17.3	
Hori.	68.434	QP	26.1	6.4	7.6	30.3	-	9.8	40.0	30.2	
Hori.	125.467	QP	24.0	13.4	8.3	30.1	-	15.6	43.5	27.9	
Hori.	249.140	QP	21.7	11.7	9.4	29.3	-	13.5	46.0	32.5	
Hori.	508.881	QP	23.2	17.5	11.1	30.0	-	21.8	46.0	24.2	
Hori.	870.894	QP	21.7	21.8	12.8	28.5	-	27.9	46.0	18.2	
Hori.	2350.079	PK	51.4	27.7	5.2	34.3	-	50.1	73.9	23.9	
Hori.	2483.500	PK	56.7	27.5	5.3	34.2	-	55.3	73.9	18.6	
Hori.	2606.032	PK	58.8	27.7	5.4	34.2	-	57.7	73.9	16.2	
Hori.	4956.000	PK	43.9	31.6	7.5	33.5	-	49.6	73.9	24.3	
Hori.	7434.000	PK	42.8	36.3	8.7	33.5	-	54.3	73.9	19.7	Floor noise
Hori.	9912.000	PK	43.0	39.0	9.3	33.8	-	57.4	73.9	16.6	Floor noise
Hori.	2350.079	AV	45.9	27.7	5.2	34.3	0.5	45.1	53.9	8.8	
Hori.	2483.500	AV	38.4	27.5	5.3	34.2	0.5	37.5	53.9	16.4	*1)
Hori.	2606.032	AV	52.0	27.7	5.4	34.2	0.5	51.3	53.9	2.6	
Hori.	4956.000	AV	35.5	31.6	7.5	33.5	0.5	41.7	53.9	12.2	
Hori.	7434.000	AV	33.6	36.3	8.7	33.5	-	45.0	53.9	8.9	Floor noise
Hori.	9912.000	AV	33.3	39.0	9.3	33.8	-	47.7	53.9	6.2	Floor noise
Vert.	33.148	QP	30.1	17.5	7.1	30.5	-	24.2	40.0	15.9	
Vert.	71.734	QP	26.9	6.3	7.7	30.3	-	10.5	40.0	29.5	
Vert.	127.208	QP	26.2	13.5	8.3	30.0	-	17.9	43.5	25.6	
Vert.	249.140	QP	23.0	11.7	9.4	29.3	-	14.8	46.0	31.2	
Vert.	508.881	QP	23.2	17.5	11.1	30.0	-	21.8	46.0	24.2	
Vert.	870.894	QP	21.7	21.8	12.8	28.5	-	27.9	46.0	18.2	
Vert.	2350.079	PK	51.9	27.7	5.2	34.3	-	50.6	73.9	23.3	
Vert.	2483.500	PK	55.1	27.5	5.3	34.2	-	53.7	73.9	20.2	
Vert.	2606.032	PK	56.3	27.7	5.4	34.2	-	55.2	73.9	18.7	
Vert.	4956.000	PK	45.4	31.6	7.5	33.5	-	51.1	73.9	22.8	
Vert.	7434.000	PK	42.8	36.3	8.7	33.5	-	54.2	73.9	19.7	Floor noise
Vert.	9912.000	PK	42.9	39.0	9.3	33.8	-	57.3	73.9	16.6	Floor noise
Vert.	2350.079	AV	47.7	27.7	5.2	34.3	0.5	46.9	53.9	7.1	
Vert.	2483.500	AV	38.4	27.5	5.3	34.2	0.5	37.5	53.9	16.4	*1)
Vert.	2606.032	AV	53.1	27.7	5.4	34.2	0.5	52.5	53.9	1.4	
Vert.	4956.000	AV	39.5	31.6	7.5	33.5	0.5	45.6	53.9	8.3	
Vert.	7434.000	AV	33.5	36.3	8.7	33.5	-	44.9	53.9	9.0	Floor noise
Vert.	9912.000	AV	33.3	39.0	9.3	33.8	-	47.7	53.9	6.2	Floor noise

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

*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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

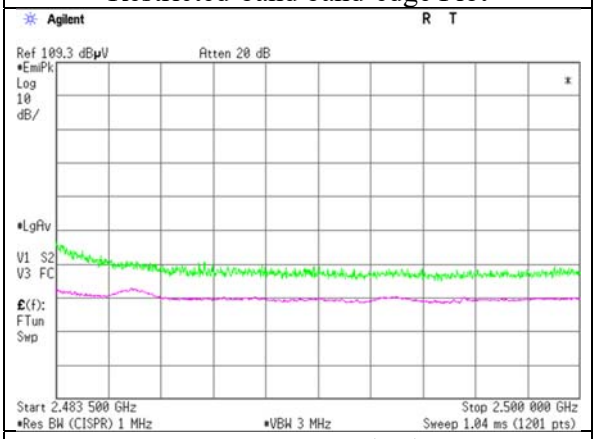
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12865562H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	October 25, 2019
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Junya Okuno
	(1 GHz - 10 GHz)
Mode	Tx GFSK 2478 MHz

Horizontal

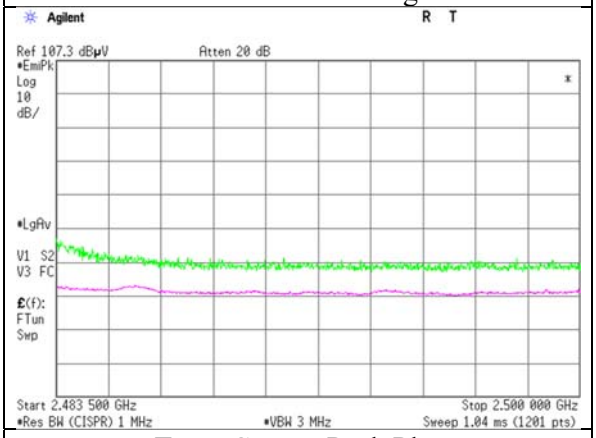
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

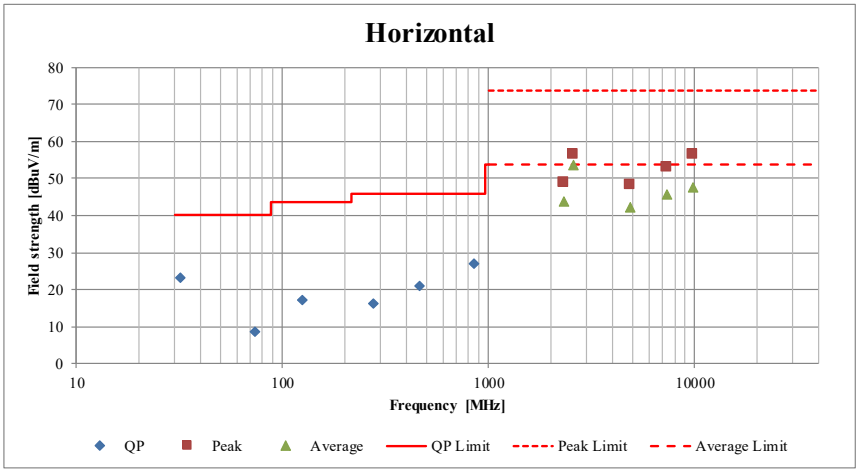


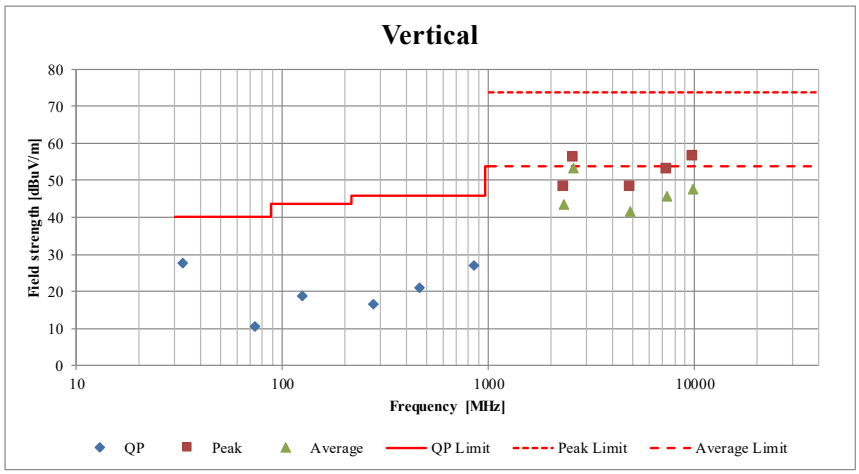
Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.	12865562H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 5, 2019	October 27, 2019	October 28, 2019
Temperature / Humidity	23 deg. C / 54 % RH	22 deg. C / 54 % RH	22 deg. C / 42 % RH
Engineer	Yuta Moriya	Takafumi Noguchi	Yuta Moriya
	(1 GHz - 10 GHz)	(10 GHz-26.5 GHz)	Below 1 GHz
Mode	Tx 2478 MHz		



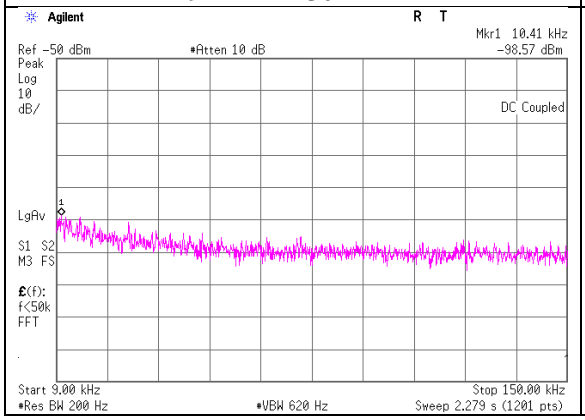


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

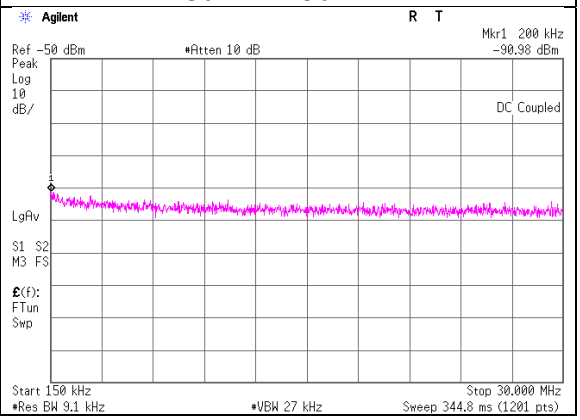
Conducted Spurious Emission

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	November 5, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Yuta Moriya
Mode	Tx 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
10.41	-98.6	0.40	9.8	3.0	1	-85.3	300	6.0	-24.1	47.2	71.3	
200.00	-91.0	0.40	9.8	3.0	1	-77.8	300	6.0	-16.5	21.5	38.0	

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

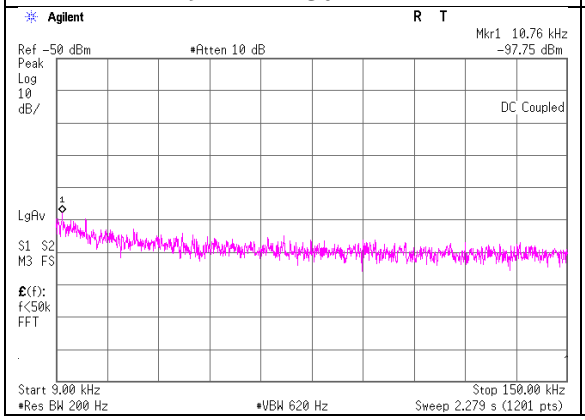
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

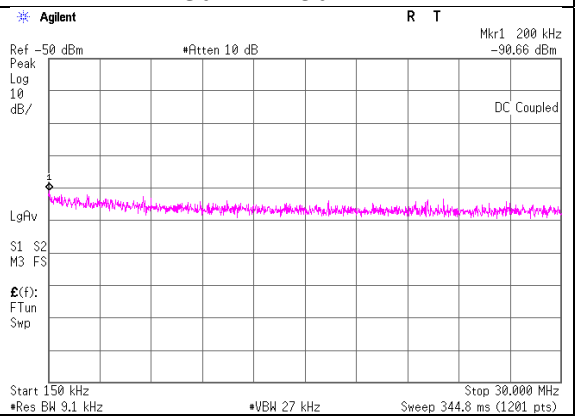
Conducted Spurious Emission

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	November 5, 2019
Temperature / Humidity	23 deg. C / 38 % 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
10.76	-97.8	0.42	9.8	3.0	1	-84.5	300	6.0	-23.2	46.9	70.1	
200.00	-90.7	0.42	9.8	3.0	1	-77.4	300	6.0	-16.2	21.5	37.7	

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

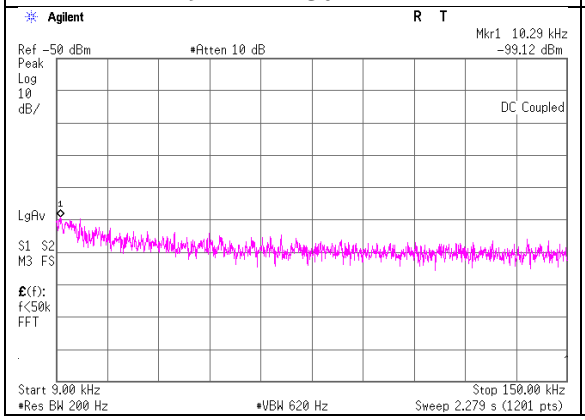
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

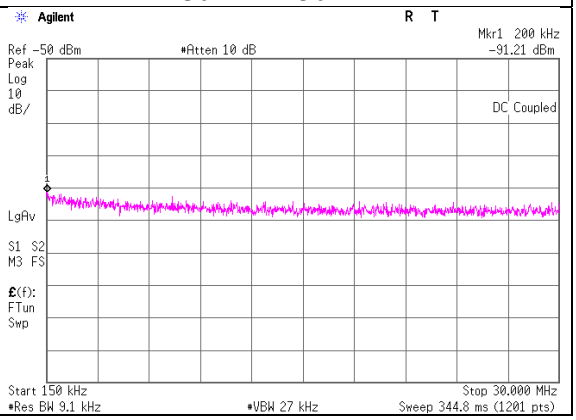
Conducted Spurious Emission

Report No.	12865562H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	November 5, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Yuta Moriya
Mode	Tx 2478 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
10.29	-99.1	0.43	9.8	3.0	1	-85.9	300	6.0	-24.6	47.3	71.9	
200.00	-91.2	0.43	9,81	3.0	1	-87.8	300	6.0	-26.5	21.5	48.0	

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.	12865562H
Test place	Ise EMC Lab. No.4 Measurement Room
Date	November 5, 2019
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Yuta Moriya
Mode	Tx

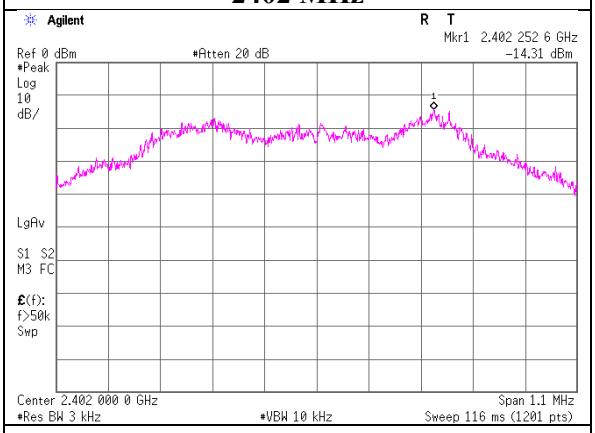
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-14.31	0.40	10.06	-3.86	8.00	11.86
2440	-13.91	0.42	10.06	-3.43	8.00	11.43
2478	-14.10	0.43	10.06	-3.61	8.00	11.61

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

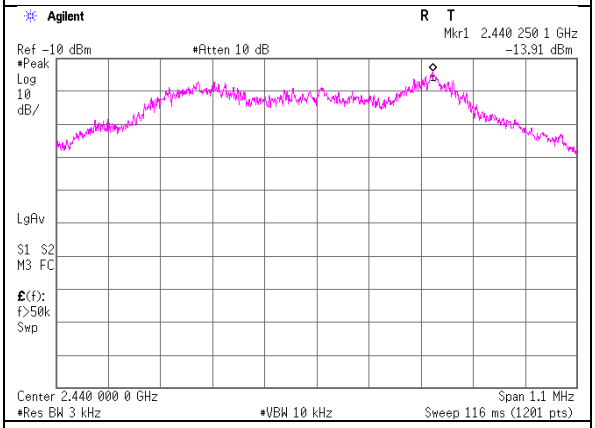
*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density

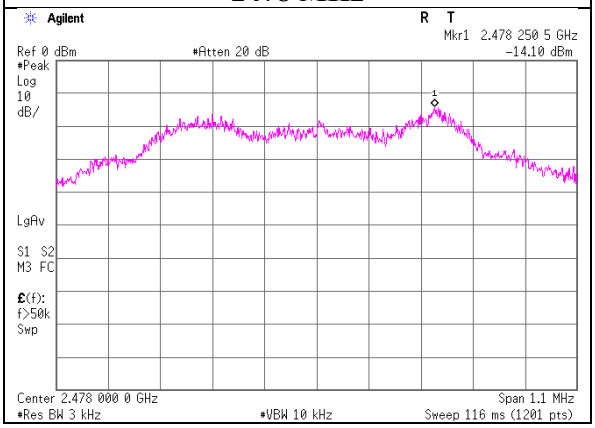
2402 MHz



2440 MHz



2478 MHz



APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/20/2019	08/31/2020	12
RE	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	08/06/2019	08/31/2020	12
RE	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/01/2019	04/30/2021	24
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	01/21/2019	01/31/2020	12
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/05/2018	12/31/2019	12
RE	141855	Spectrum Analyzer	AGILENT	E4440A	MY46187750	11/09/2018	11/30/2019	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	09/03/2019	09/30/2020	12
RE	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/11/2019	09/30/2020	12
RE/CE	178648	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142228	Measure	KOMELON	KMC-36	-	-	-	-
AT	141900	Spectrum Analyzer	AGILENT	E4440A	MY46185823	11/15/2018	11/30/2019	12
AT	141334	Attenuator(10dB)	Suhner	6810.19.A	-	12/06/2018	12/31/2019	12
AT	141809	Power Meter	ANRITSU	ML2495A	825002	05/16/2019	05/31/2020	12
AT	141830	Power sensor	ANRITSU	MA2411B	738285	05/16/2019	05/31/2020	12
AT	141564	Thermo-Hygrometer	CUSTOM	CTH-201	0004	12/05/2018	12/31/2019	12
CE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/05/2019	07/31/2020	12
CE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/02/2019	08/31/2020	12
CE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/29/2019	01/31/2020	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/06/2018	12/31/2019	12
CE	141884	Spectrum Analyzer	AGILENT	E4448A	MY44020357	03/13/2019	03/31/2020	12
CE	141217	Coaxial cable	Fujikura/Suhner/ TSJ	5D-2W/SFM141/421-010/sucoform141-P	-/04178	06/18/2019	06/30/2020	12
CE	142227	Measure	KOMELON	KMC-36	-	-	-	-
CE	142147	Conversion adapter	-	VP11B	-	-	-	-
CE	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	01/11/2019	01/31/2020	12

***Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

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

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

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