



RADIO TEST REPORT

Test Report No. : 13516052S-A-R1

Applicant : CASIO COMPUTER CO., LTD.
Type of EUT : Watch
Model Number of EUT : MSG-B100
FCC ID : BBQS12W
Test regulation : FCC Part 15 Subpart C: 2020
Test Result : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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 must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13516052S-A. 13516052S-A is replaced with this report.

Date of test: October 12 to 13, 2020

Representative test engineer:

T. Kawakami

Takahiro Kawakami
Engineer
Consumer Technology Division

Approved by:

A. Hayashi

Akio Hayashi
Leader
Consumer Technology Division



CERTIFICATE 1266.03

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

UL Japan, Inc.
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

REVISION HISTORY

Original Test Report No.: 13516052S-A

Revision	Test report No.	Date	Page revised	Contents		
- (Original)	13516052S-A	November 24, 2020	-	-		
1	13516052S-A-R1	February 19, 2021	14	Re-location of remarks *4) on Section 6: From <table border="1"><tr><td>Spectrum Analyzer *3) *4)</td></tr></table> To <table border="1"><tr><td>Conducted Spurious Emission *4) *5)</td></tr></table>	Spectrum Analyzer *3) *4)	Conducted Spurious Emission *4) *5)
Spectrum Analyzer *3) *4)						
Conducted Spurious Emission *4) *5)						

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
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		

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

CONTENTS	PAGE
SECTION 1: Customer information.....	5
SECTION 2: Equipment under test (EUT).....	5
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of EUT during testing.....	10
SECTION 5: Radiated Spurious Emission	12
SECTION 6: Antenna Terminal Conducted Tests.....	14
APPENDIX 1: Test data	15
6 dB Bandwidth and 99 % Occupied Bandwidth.....	15
Maximum Peak Output Power	18
Average Output Power	19
Radiated Spurious Emission	21
Conducted Spurious Emission	27
Power Density	30
APPENDIX 2: Test instruments	32
APPENDIX 3: Photographs of test setup	34
Radiated Spurious Emission	34
Pre-Check Worst Case Position	35
Antenna Terminal Conducted Tests.....	36

SECTION 1: Customer information

Company Name : CASIO COMPUTER CO., LTD.
Address : 2-1, Sakaecho 3 chome, Hamura-shi, Tokyo 205-8555 Japan
Telephone Number : +81-42-579-7282
Facsimile Number : +81-42-579-7702
Contact Person : Yamashita Shuji

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) other than the Receipt Date
- 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 : Watch
Model Number : MSG-B100
Serial Number : Refer to SECTION 4.2
Rating : MSG-B100 (Watch): Typical: DC 2.5 V, Min.: DC 1.9 V, Max.: DC 2.7 V
CW5659 (Module): Normal: DC 3.0 V, Min.: DC 1.9 V, Max.: DC 3.3 V
Receipt Date : October 12, 2020
Country of Mass-production : China, Japan, Thailand
Condition : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification : No Modification by the test lab.

2.2 Product Description

Model: MSG-B100 (referred to as the EUT in this report) is a Watch.

* MSG-B100 has alternative name as R034

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : GFSK
Antenna type : Chip Antenna (Mono Pole), SMD
Antenna Gain : 2.5 dBi
Clock frequency (Maximum) : 32 MHz

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on October 13, 2020
The revision does not affect the test specification applied to the EUT.

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

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods ISED: RSS-Gen 8.8	FCC: Section 15.207 ISED: RSS-Gen 8.8	N/A	N/A	*1)
6dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(2) ISED: RSS-247 5.2(a)	See data.	Complied a)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ISED: RSS-247 5.4(d)		Complied b)	Conducted
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(e) ISED: RSS-247 5.2(b)		Complied c)	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.1 dB 4804.000 MHz, AV, Hori. Tx BT LE 2402 MHz	Complied d), e)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
<p>Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT does not have AC mains. *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 6 dB Bandwidth and 99 % Occupied Bandwidth) b) Refer to APPENDIX 1 (data of Maximum Peak Output Power) c) Refer to APPENDIX 1 (data of Power Density) d) Refer to APPENDIX 1 (data of Conducted Spurious Emission) e) Refer to APPENDIX 1 (data of Radiated Spurious Emission)</p>					
<p>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.</p>					

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

FCC Part 15.31 (e)

The EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.

Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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 $k = 2$.

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 dB	-

SAC = Semi-Anechoic Chamber

SR = Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %
Temperature	0.95 deg.C.
Voltage	0.83 %

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401

A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

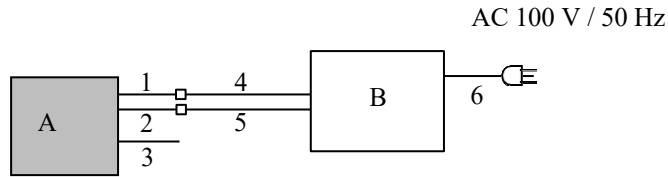
4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth (BT) Low Energy (LE)	Uncoded 1 M-PHY, Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: BT LE 1 M-PHY: Fixed Software: BLE RF Test Version 9.9 (Date: 2020.10.12, Storage location: EUT memory)	
*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	Tx BT LE 1 M-PHY	2402 MHz 2440 MHz 2480 MHz
Spurious Emission	Tx BT LE 1 M-PHY	2402 MHz 2440 MHz 2480 MHz
6 dB Bandwidth Maximum Peak Output Power Power Density 99 % Occupied Bandwidth	Tx BT LE 1 M-PHY	2402 MHz 2440 MHz 2480 MHz

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Watch	MSG-B100	53 *1) 10 *2)	Casio	EUT
B	Power Supply (DC)	PAN35-10A	NA000955	KIKUSUI	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.1	Unshielded	Unshielded	*3)
2	DC	0.1	Unshielded	Unshielded	*3)
3	Signal	0.1	Unshielded	Unshielded	*4)
4	DC	2.0	Unshielded	Unshielded	Extension
5	DC	2.0	Unshielded	Unshielded	Extension
6	AC	2.0	Unshielded	Unshielded	-

*3) Cable for test operation

*4) Cable for system reset during the development, not used for the product

SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

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

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

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

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

UL Japan, Inc.

Shonan EMC Lab.

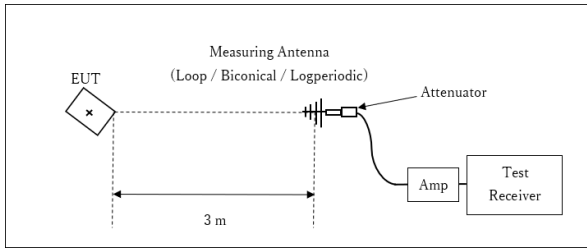
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Figure 2: Test Setup

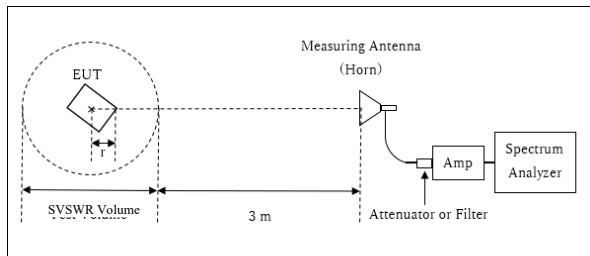
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



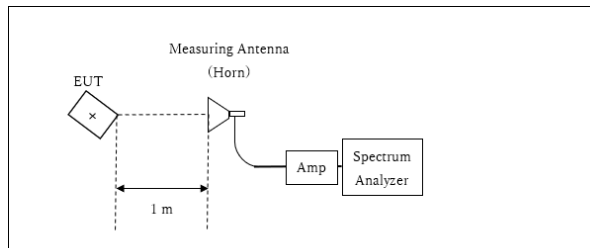
r : Radius of an outer periphery of EUT

× : Center of turn table

Distance Factor: $20 \times \log(3.96 \text{ m} / 3.0 \text{ m}) = 2.42 \text{ dB}$
 * Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.96 \text{ m}$

SVSWR Volume : 2.0 m
 (SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.04 \text{ m}$

10 GHz – 26.5 GHz



× : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$
 *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.

Antenna polarization	Frequency	Spurious				
		Below 1 GHz	1 GHz – 2.8 GHz	2.8 GHz – 10 GHz	10 GHz - 18 GHz	18 GHz - 26 GHz
Horizontal		X	Z	X	X	X
Vertical		X	Z	Y	X	X

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

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

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 6: 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
6 dB Bandwidth	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
*1) Peak hold was applied as Worst-case measurement. *2) Reference data *3) Section 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 low enough as shown in the chart. *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 Ohms. 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

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

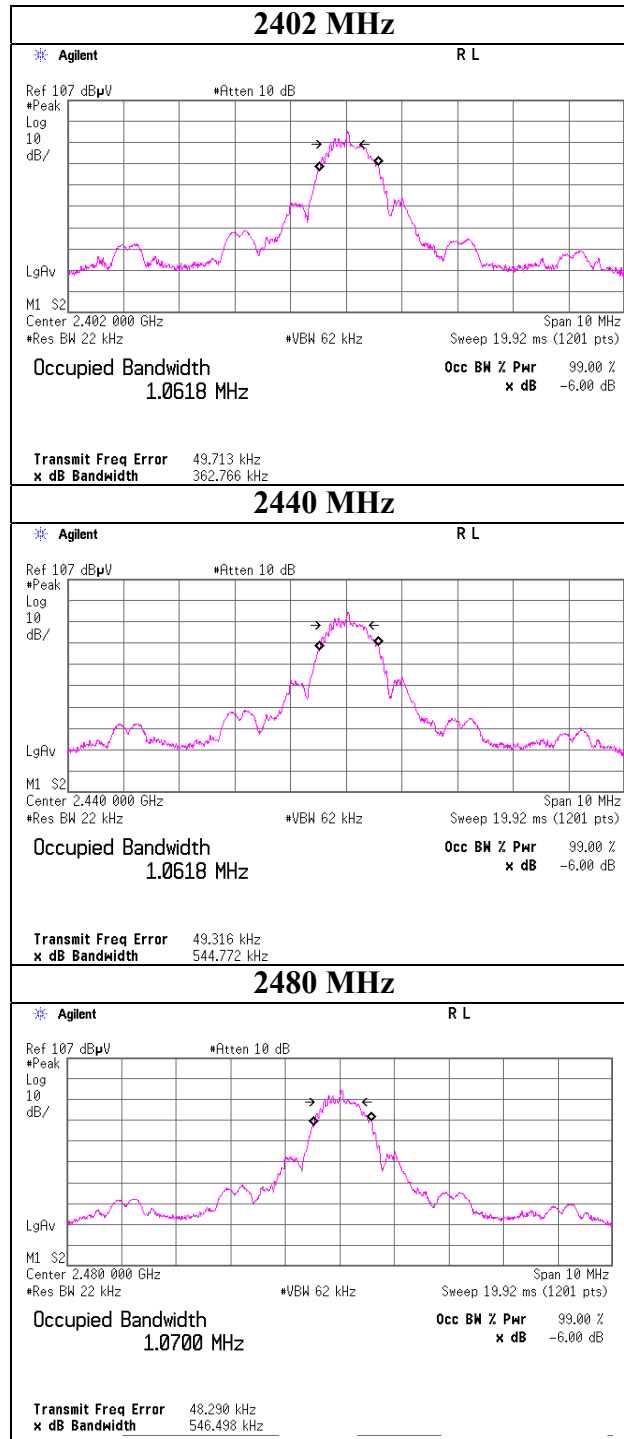
APPENDIX 1: Test data

6 dB Bandwidth and 99 % Occupied Bandwidth

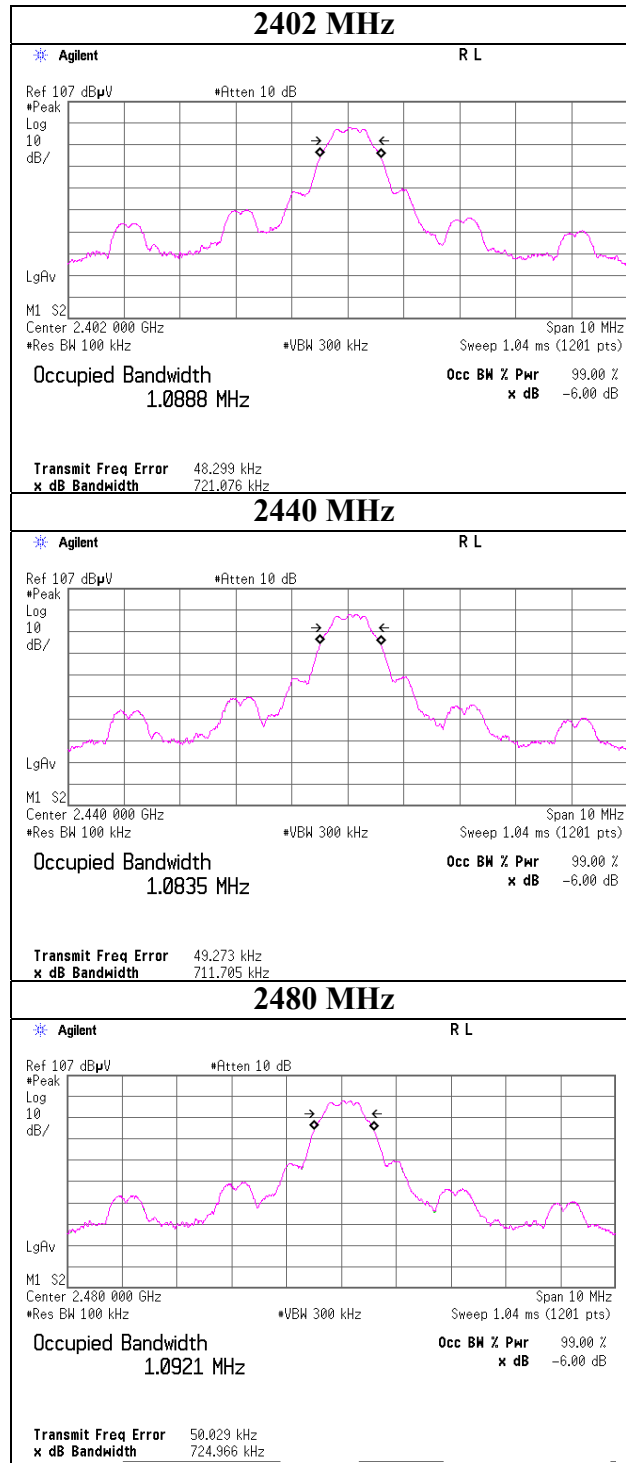
Report No. 13516052S-A-R1
Test place Shonan EMC Lab. No.6 Shielded Room
Date October 12, 2020
Temperature / Humidity 24 deg. C / 51 % RH
Engineer Takahiro Kawakami
Mode Tx BT LE

Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
2402	1061.8	0.721	> 0.5000
2440	1061.8	0.712	> 0.5000
2480	1070.0	0.725	> 0.5000

99 % Occupied Bandwidth



6 dB Bandwidth



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Maximum Peak Output Power

Report No. 13516052S-A-R1
Test place Shonan EMC Lab. No.6 Shielded Room
Date October 12, 2020
Temperature / Humidity 24 deg. C / 51 % RH
Engineer Takahiro Kawakami
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-11.94	1.16	9.88	-0.90	0.81	30.00	1000	30.90	2.50	1.60	1.45	36.02	4000	34.42
2440	-11.97	1.16	9.88	-0.93	0.81	30.00	1000	30.93	2.50	1.57	1.44	36.02	4000	34.45
2480	-12.05	1.17	9.88	-1.00	0.79	30.00	1000	31.00	2.50	1.50	1.41	36.02	4000	34.52

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

Average Output Power
(Reference data for RF Exposure)

Report No. 13516052S-A-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date October 12, 2020
Temperature / Humidity 24 deg. C / 51 % RH
Engineer Takahiro Kawakami
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-14.21	1.16	9.88	-3.17	0.48	1.67	-1.50	0.71
2440	-14.24	1.16	9.88	-3.20	0.48	1.67	-1.53	0.70
2480	-14.38	1.17	9.88	-3.33	0.46	1.67	-1.66	0.68

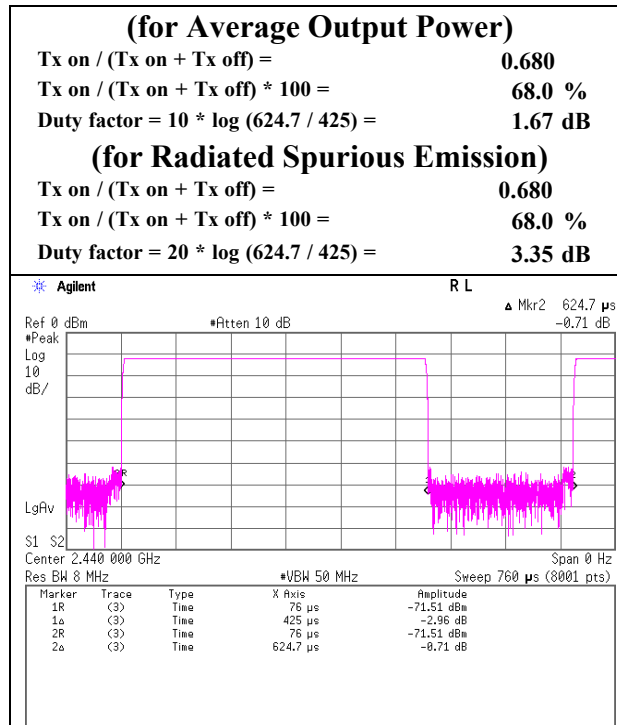
Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Result (Burst power average) = Time average + Duty factor

Burst rate confirmation

Report No.	13516052S-A-R1
Test place	Shonan EMC Lab. No.6 Shielded Room
Date	October 12, 2020
Temperature / Humidity	24 deg. C / 51 % RH
Engineer	Takahiro Kawakami
Mode	Tx BT LE



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

Radiated Spurious Emission

Report No. 13516052S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date October 12, 2020 October 13, 2020
Temperature / Humidity 22 deg.C, 65 %RH 25 deg.C, 66 %RH
Engineer Yusuke Tanikawara Yusuke Tanikawara
(30 MHz -1 GHz) (1 GHz -26.5 GHz)
Mode Tx BT LE 2402 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	30.105	QP	21.80	18.82	6.81	31.90	0.00	15.53	40.0	24.4	150	359	-
Hori.	182.344	QP	21.90	16.12	8.73	31.77	0.00	14.98	43.5	28.5	200	359	-
Hori.	886.441	QP	20.90	22.12	9.41	30.92	0.00	21.51	46.0	24.4	100	359	-
Hori.	915.600	QP	20.60	22.05	9.54	30.75	0.00	21.44	46.0	24.5	100	359	-
Hori.	2390.000	PK	44.67	28.56	14.04	38.68	2.42	51.01	73.9	22.8	132	165	-
Hori.	4804.000	PK	49.63	31.62	6.57	38.54	2.42	51.70	73.9	22.2	100	37	-
Hori.	7206.000	PK	46.71	37.62	8.13	39.13	2.42	55.75	73.9	18.1	150	0	Floor noise
Hori.	7206.000	AV	36.56	37.62	8.13	39.13	2.42	45.60	53.9	8.3	150	0	Floor noise
Vert.	30.850	QP	22.50	18.43	6.83	31.90	0.00	15.86	40.0	24.1	100	359	-
Vert.	150.091	QP	21.80	14.83	8.61	31.80	0.00	13.44	43.5	30.0	100	359	-
Vert.	815.395	QP	21.20	20.87	9.09	31.29	0.00	19.87	46.0	26.1	100	359	-
Vert.	866.434	QP	21.20	21.93	9.31	31.01	0.00	21.43	46.0	24.5	100	359	-
Vert.	2390.000	PK	45.01	28.56	14.04	38.68	2.42	51.35	73.9	22.5	214	156	-
Vert.	4804.000	PK	47.62	31.62	6.57	38.54	2.42	49.69	73.9	24.2	149	143	-
Vert.	7206.000	PK	46.35	37.62	8.13	39.13	2.42	55.39	73.9	18.5	150	0	Floor noise
Vert.	7206.000	AV	36.61	37.62	8.13	39.13	2.42	45.65	53.9	8.2	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log(3.96 m / 3.0 m) = 2.42 dB

10 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	35.46	28.56	14.04	38.68	3.35	2.42	45.15	53.9	8.7	*1)
Hori.	4804.000	AV	41.29	31.62	6.57	38.54	3.35	2.42	46.71	53.9	7.1	-
Vert.	2390.000	AV	35.45	28.56	14.04	38.68	3.35	2.42	45.14	53.9	8.7	*1)
Vert.	4804.000	AV	39.77	31.62	6.57	38.54	3.35	2.42	45.19	53.9	8.7	-

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

Distance factor : 1 GHz - 10 GHz : 20log(3.96 m / 3.0 m) = 2.42 dB

10 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Burst rate confirmation" sheet.

*1) Not out of band emission (Leakage Power)

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	78.79	28.54	14.05	38.67	2.42	85.13	-	-	Carrier
Hori.	2398.029	PK	39.86	28.54	14.04	38.67	2.42	46.19	65.1	18.9	-
Hori.	2400.000	PK	40.80	28.54	14.05	38.67	2.42	47.14	65.1	17.9	-
Vert.	2402.000	PK	75.98	28.54	14.05	38.67	2.42	82.32	-	-	Carrier
Vert.	2400.000	PK	39.77	28.54	14.05	38.67	2.42	46.11	62.3	16.1	-

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

Distance factor : 1 GHz - 10 GHz : 20log(3.96 m / 3.0 m) = 2.42 dB

10 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

UL Japan, Inc.

Shonan EMC Lab.

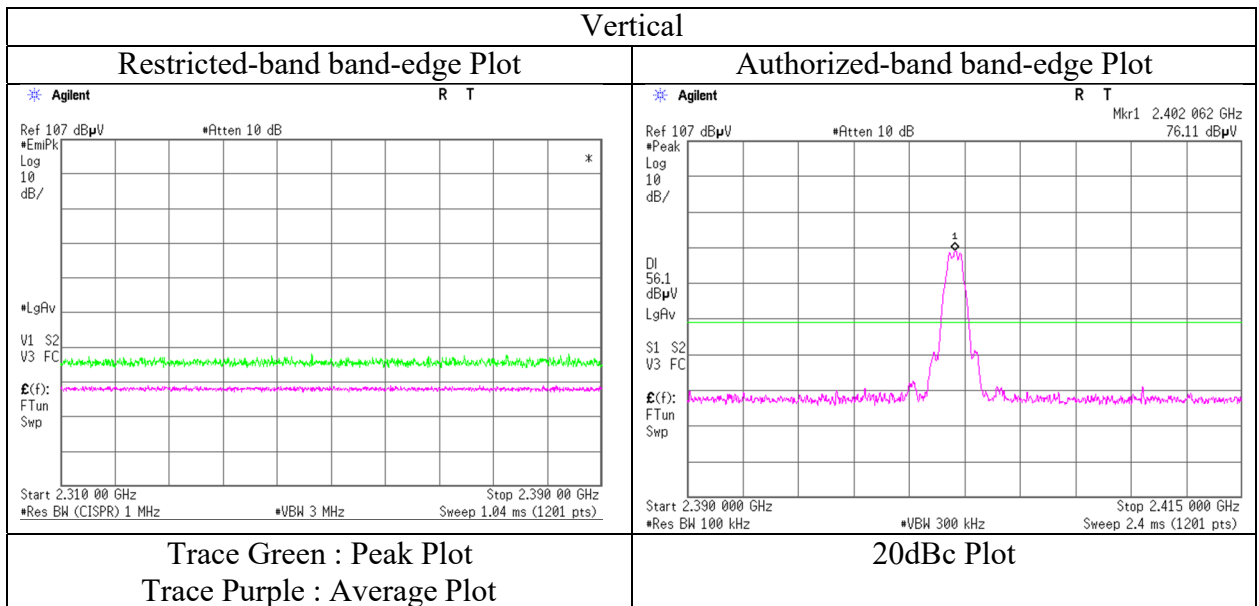
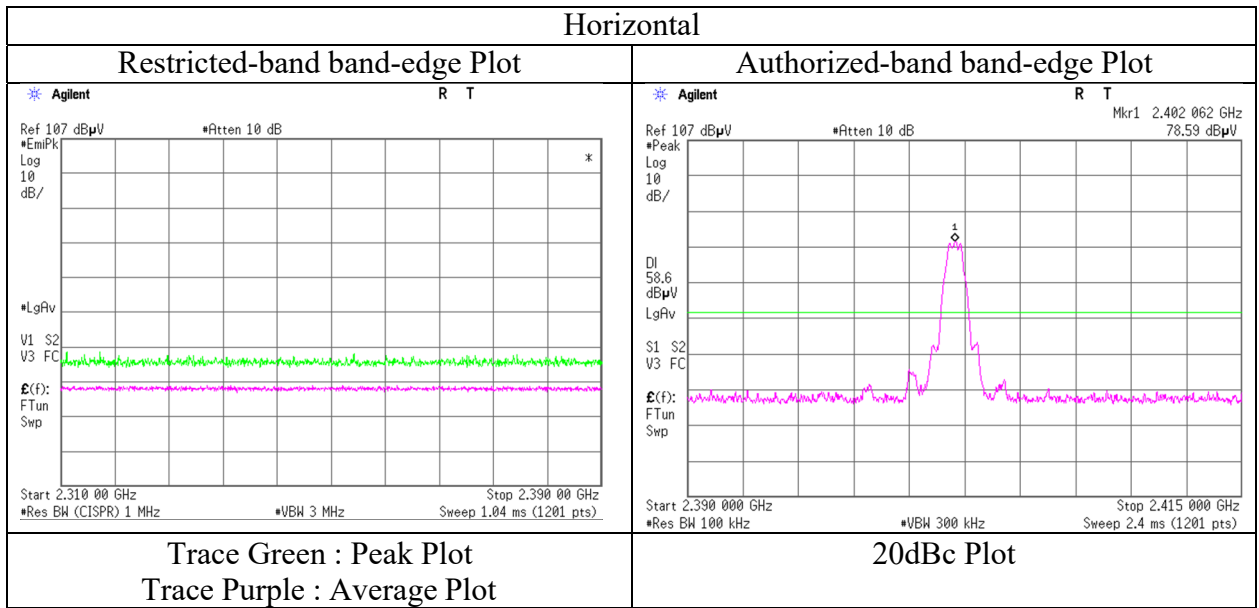
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Report No. 13516052S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date October 13, 2020
Temperature / Humidity 25 deg.C, 66 %RH
Engineer Yusuke Tanikawara
Mode Tx BT LE 2402 MHz



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

Radiated Spurious Emission

Report No.	13516052S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	2	2
Date	October 12, 2020	October 13, 2020
Temperature / Humidity	22 deg.C, 65 %RH	25 deg.C, 66 %RH
Engineer	Yusuke Tanikawara (30 MHz -1 GHz)	Yusuke Tanikawara (1 GHz -26.5 GHz)
Mode	Tx BT LE 2440 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	30.149	QP	21.80	18.79	6.81	31.90	0.00	15.50	40.0	24.5	200	359	-
Hori.	198.512	QP	21.80	16.55	8.81	31.76	0.00	15.40	43.5	28.1	150	359	-
Hori.	885.202	QP	20.90	22.11	9.40	30.93	0.00	21.48	46.0	24.5	100	359	-
Hori.	943.116	QP	20.80	21.88	9.65	30.55	0.00	21.78	46.0	24.2	100	359	-
Hori.	4880.000	PK	48.10	31.58	6.63	38.54	2.42	50.19	73.9	23.7	122	186	-
Hori.	7320.000	PK	46.16	37.73	8.21	39.28	2.42	55.24	73.9	18.6	150	0	Floor noise
Hori.	7320.000	AV	36.18	37.73	8.21	39.28	2.42	45.26	53.9	8.6	150	0	Floor noise
Vert.	31.508	QP	22.70	18.15	6.85	31.90	0.00	15.80	40.0	24.2	100	359	-
Vert.	159.775	QP	21.90	15.16	8.71	31.79	0.00	13.98	43.5	29.5	100	359	-
Vert.	799.900	QP	21.30	20.87	9.02	31.38	0.00	19.81	46.0	26.1	100	359	-
Vert.	849.185	QP	21.10	21.53	9.24	31.08	0.00	20.79	46.0	25.2	100	359	-
Vert.	4880.000	PK	48.10	31.58	6.63	38.54	2.42	50.19	73.9	23.7	180	210	-
Vert.	7320.000	PK	45.40	37.73	8.21	39.28	2.42	54.48	73.9	19.4	150	0	Floor noise
Vert.	7320.000	AV	36.10	37.73	8.21	39.28	2.42	45.18	53.9	8.7	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log(3.96 m / 3.0 m) = 2.42 dB

10 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	40.36	31.58	6.63	38.54	3.35	2.42	45.80	53.9	8.1	-
Vert.	4880.000	AV	40.33	31.58	6.63	38.54	3.35	2.42	45.77	53.9	8.1	-

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

Distance factor : 1 GHz - 10 GHz : 20log(3.96 m / 3.0 m) = 2.42 dB

10 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Burst rate confirmation" sheet.

Radiated Spurious Emission

Report No.	13516052S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	2	2
Date	October 12, 2020	October 13, 2020
Temperature / Humidity	22 deg.C, 65 %RH	25 deg.C, 66 %RH
Engineer	Yusuke Tanikawara	Yusuke Tanikawara
	(30 MHz -1 GHz)	(1 GHz -26.5 GHz)
Mode	Tx BT LE 2480 MHz	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	33.762	QP	21.80	17.25	6.90	31.90	0.00	14.05	40.0	25.9	150	359	-
Hori.	155.314	QP	22.00	14.96	8.68	31.80	0.00	13.84	43.5	29.6	200	359	-
Hori.	881.104	QP	21.00	22.11	9.39	30.95	0.00	21.55	46.0	24.4	100	359	-
Hori.	948.201	QP	20.70	21.93	9.67	30.52	0.00	21.78	46.0	24.2	150	359	-
Hori.	2483.500	PK	44.83	28.40	14.13	38.62	2.42	51.16	73.9	22.7	155	156	-
Hori.	4960.000	PK	47.09	31.74	6.68	38.54	2.42	49.39	73.9	24.5	113	5	-
Hori.	7440.000	PK	45.75	37.84	8.30	39.43	2.42	54.88	73.9	19.0	150	0	Floor noise
Hori.	7440.000	AV	36.32	37.84	8.30	39.43	2.42	45.45	53.9	8.4	150	0	Floor noise
Vert.	30.043	QP	21.80	18.85	6.81	31.90	0.00	15.56	40.0	24.4	100	359	-
Vert.	172.838	QP	21.90	15.72	8.74	31.78	0.00	14.58	43.5	28.9	100	359	-
Vert.	825.500	QP	21.20	20.88	9.13	31.23	0.00	19.98	46.0	26.0	100	359	-
Vert.	870.096	QP	21.10	22.05	9.33	30.99	0.00	21.49	46.0	24.5	100	359	-
Vert.	2483.500	PK	44.91	28.40	14.13	38.62	2.42	51.24	73.9	22.6	151	317	-
Vert.	4960.000	PK	47.58	31.74	6.68	38.54	2.42	49.88	73.9	24.0	179	183	-
Vert.	7440.000	PK	45.17	37.84	8.30	39.43	2.42	54.30	73.9	19.6	150	0	Floor noise
Vert.	7440.000	AV	36.31	37.84	8.30	39.43	2.42	45.44	53.9	8.4	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log(3.96 m / 3.0 m) = 2.42 dB

10 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	35.50	28.40	14.13	38.62	3.35	2.42	45.18	53.9	8.7	*1)
Hori.	4960.000	AV	39.07	31.74	6.68	38.54	3.35	2.42	44.72	53.9	9.1	-
Vert.	2483.500	AV	35.83	28.40	14.13	38.62	3.35	2.42	45.51	53.9	8.3	*1)
Vert.	4960.000	AV	38.87	31.74	6.68	38.54	3.35	2.42	44.52	53.9	9.3	-

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

Distance factor : 1 GHz - 10 GHz : 20log(3.96 m / 3.0 m) = 2.42 dB

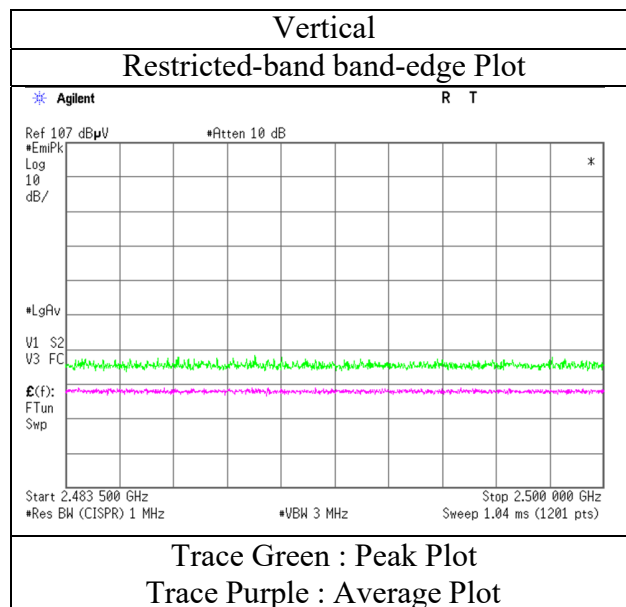
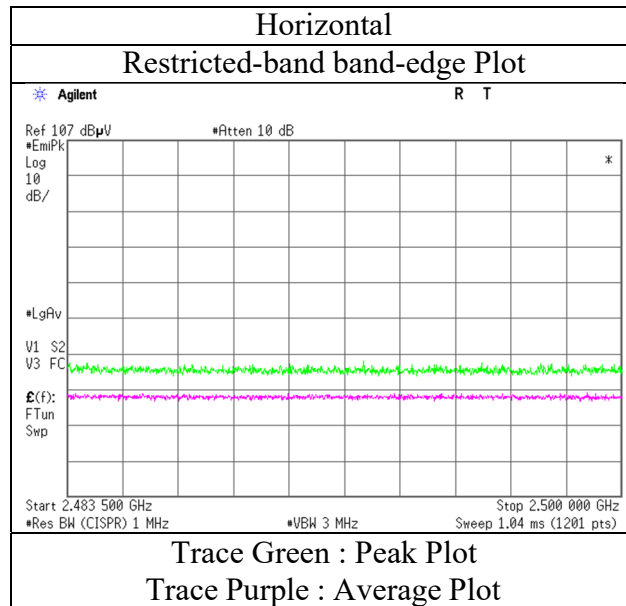
10 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Burst rate confirmation" sheet.

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

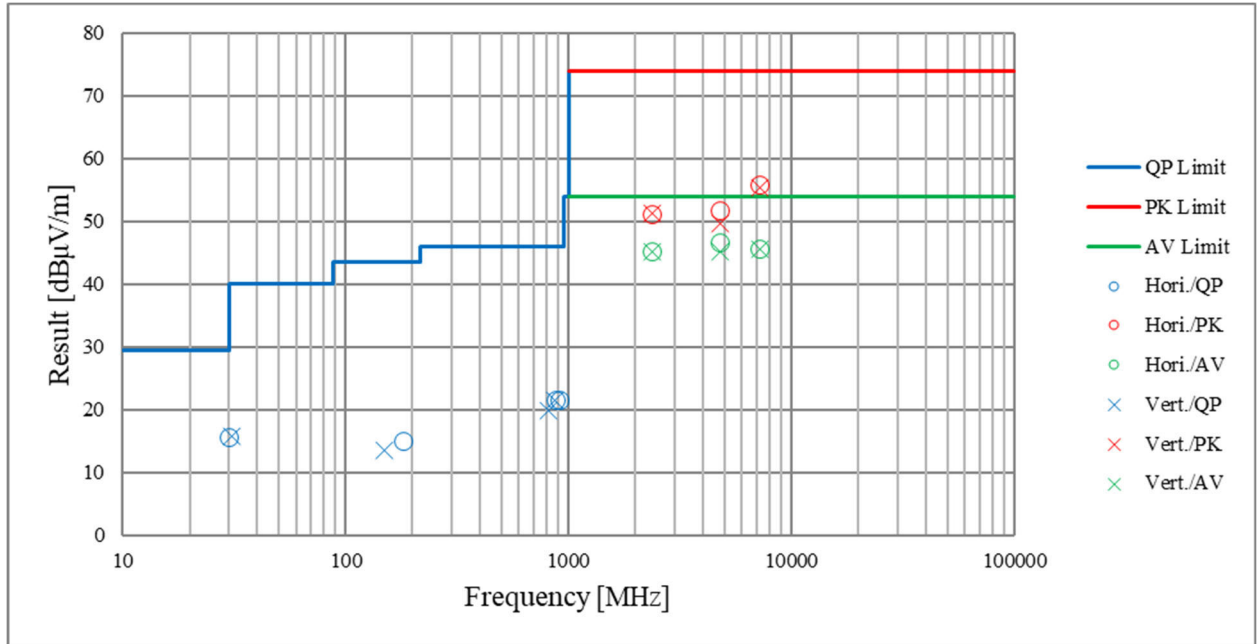
Report No. 13516052S-A-R1
Test place Shonan EMC Lab.
Semi Anechoic Chamber 2
Date October 13, 2020
Temperature / Humidity 25 deg.C, 66 %RH
Engineer Yusuke Tanikawara
Mode Tx BT LE 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

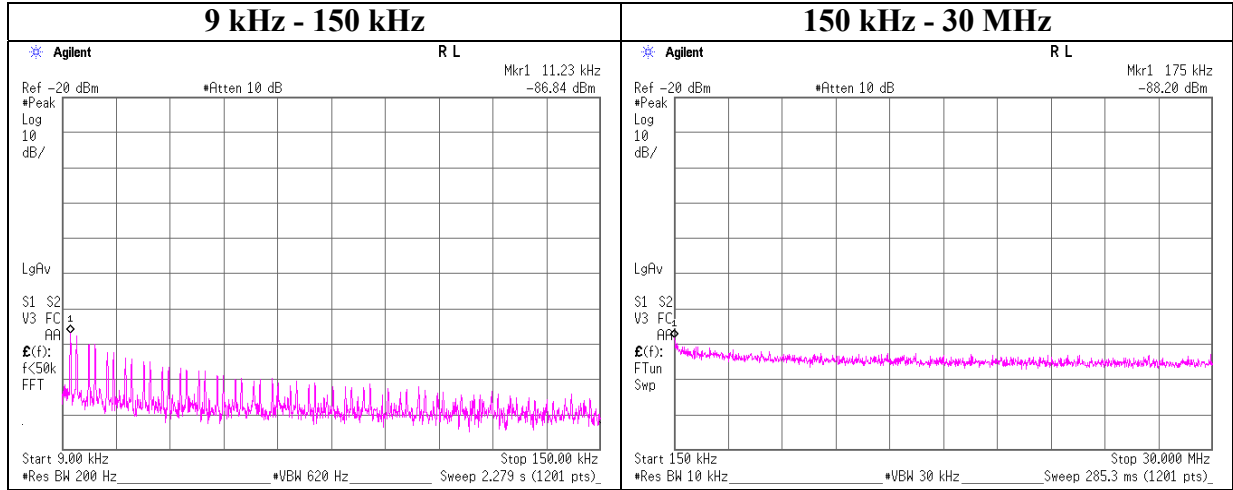
Report No.	13516052S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	2	2
Date	October 12, 2020	October 13, 2020
Temperature / Humidity	22 deg.C, 65 %RH	25 deg.C, 66 %RH
Engineer	Yusuke Tanikawara (30 MHz -1 GHz)	Yusuke Tanikawara (1 GHz -26.5 GHz)
Mode	Tx BT LE 2402 MHz	



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

Conducted Spurious Emission

Report No. 13516052S-A-R1
 Test place Shonan EMC Lab. No.6 Shielded Room
 Date October 12, 2020
 Temperature / Humidity 24 deg. C / 51 % RH
 Engineer Takahiro Kawakami
 Mode Tx BT LE 2402 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]
11.23	-86.64	0.00	9.81	2.5	1	-74.3	300	6.0	-13.1	46.5	59.6
175.00	-88.20	0.01	9.81	2.5	1	-75.9	300	6.0	-14.6	22.7	37.3

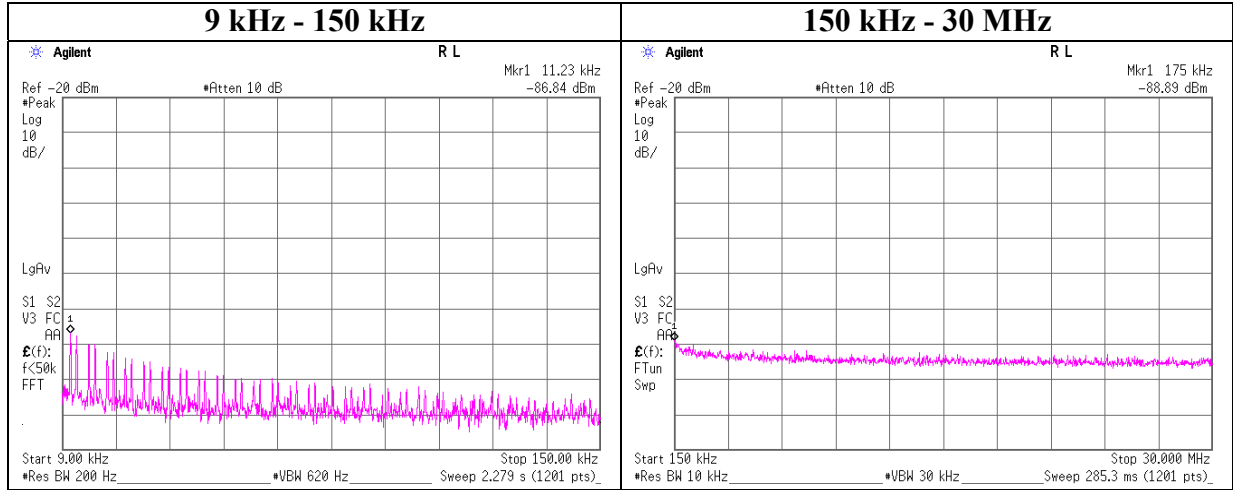
$$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log(\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$$

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

N: Number of output

Conducted Spurious Emission

Report No. 13516052S-A-R1
 Test place Shonan EMC Lab. No.6 Shielded Room
 Date October 12, 2020
 Temperature / Humidity 24 deg. C / 51 % RH
 Engineer Takahiro Kawakami
 Mode Tx BT LE 2440 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]
11.23	-86.84	0.00	9.81	2.5	1	-74.5	300	6.0	-13.3	46.5	59.8
175.00	-88.89	0.01	9.81	2.5	1	-76.6	300	6.0	-15.3	22.7	38.0

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

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

N: Number of output

UL Japan, Inc.

Shonan EMC Lab.

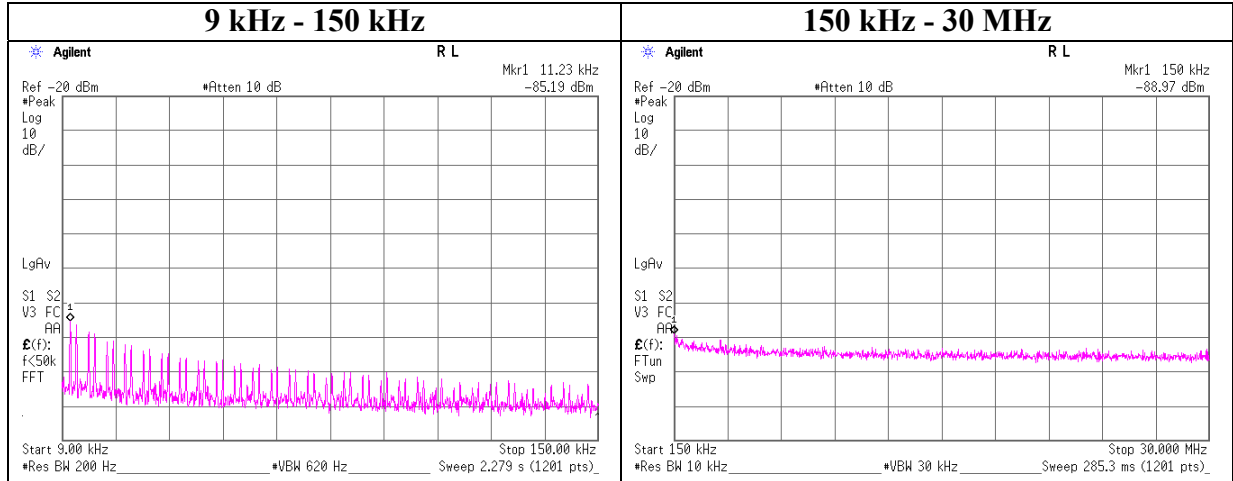
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Conducted Spurious Emission

Report No. 13516052S-A-R1
 Test place Shonan EMC Lab. No.6 Shielded Room
 Date October 12, 2020
 Temperature / Humidity 24 deg. C / 51 % RH
 Engineer Takahiro Kawakami
 Mode Tx BT LE 2480 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]
11.23	-85.19	0.00	9.81	2.5	1	-72.9	300	6.0	-11.6	46.5	58.1
150.00	-88.97	0.01	9.81	2.5	1	-76.7	300	6.0	-15.4	24.0	39.4

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

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

N: Number of output

Power Density

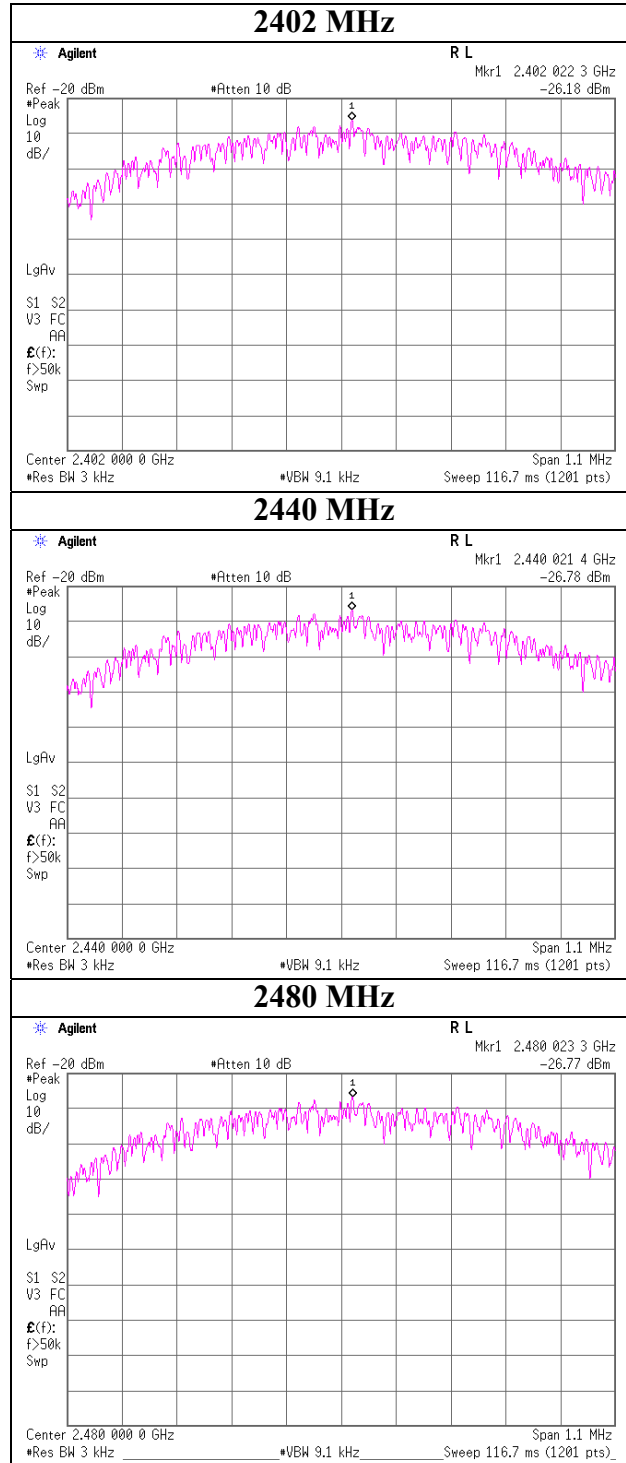
Report No. 13516052S-A-R1
Test place Shonan EMC Lab. No.5 Shielded Room
Date October 12, 2020
Temperature / Humidity 24 deg. C / 51 % RH
Engineer Takahiro Kawakami
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-26.18	1.16	9.88	-15.14	8.00	23.14
2440	-26.78	1.16	9.88	-15.74	8.00	23.74
2480	-26.77	1.17	9.88	-15.72	8.00	23.72

Sample Calculation:

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

Power Density



APPENDIX 2: Test instruments

Test equipment (1/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
AT	KTS-06	145110	Digital Tester	SANWA	PC500	7019240	2020/04/09	12
AT	SAT10-16	160494	Attenuator	Weinschel Corp.	54A-10	83420	2019/12/12	12
AT	SCC-G63	196946	Coaxial Cable	HUBER+SUNER	SUCOFLEX 102	803411/2	2020/03/10	12
AT	SJM-18	147480	Measure	ASKUL	-	-	-	-
AT	SOS-18	175822	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2020/10/01	12
AT	SPM-07	146247	Power Meter	Keysight Technologies Inc	8990B	MY5100272	2020/05/27	12
AT	SPSS-04	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2020/05/27	12
AT	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2020/04/16	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	KJM-10	146454	Measure	KOMELON	KMC-36	-	-	-
RE	SAEC-02(NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2020/03/20	12
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2020/05/07	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2020/02/19	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2020/06/03	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2020/03/03	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2020/10/05	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2020/01/30	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2020/02/21	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess - Elektronik	BBA9106	91032665	2020/04/04	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/141PE/141PE/NS 4906	-/0901-270(RF Selector)	2020/04/17	12
RE	SCC-B2/B4/B6/B7/B8/B13/SRSE-02	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/141PE/141PE/NS 4906	-/0901-270(RF Selector)	2020/04/17	12
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2020/03/04	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS /B	1612S006	2020/01/08	12
RE	SCC-G50	178573	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	MY13407/4E	2020/03/09	12
RE	SCC-G51	178572	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800288 /4A	2020/03/09	12
RE	SCC-G57	179540	Coaxial Cable	HUBER+SUNER	SUCOFLEX 102	802815/2	2020/05/12	12
RE	SCC-G69	200009	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	575617/4	2020/07/07	12

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test equipment (2/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2020/10/05	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-726	2020/06/15	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2020/06/15	12
RE	SHA-09	194684	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA 9120 C	695	2020/02/17	12
RE	SJM-09	145336	Measure	PROMART	SEN1935	-	-	-
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	VUSLP9111B	195	2020/04/04	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2020/09/28	12
RE	SRENT-09	150461	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186392	2020/02/10	12
RE	STR-07	146209	Receiver, EMI	Rohde & Schwarz	ESU26	100484	2020/09/07	12
RE	STS-02	145793	Digital Hitster	Hioki	3805-50	80997819	2020/04/09	12

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

The expiration date of the calibration is the end of the expired month.

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

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

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