



# RADIO TEST REPORT

Test Report No. : 12054556S-A-R1

**Applicant** : CASIO COMPUTER CO., LTD.  
**Type of Equipment** : Watch  
**Model No.** : MTG-B1000  
**FCC ID** : BBQS09W  
**Test regulation** : FCC Part 15 Subpart C: 2018  
**Test item** : Radiated Spurious Emission  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
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. This report is a revised version of 12054556S-A. 12054556S-A is replaced with this report.

**Date of test:**

January 13 and 14, 2018

**Representative test engineer:**

Shiro Kobayashi  
Engineer

Consumer Technology Division

**Approved by:**

Akio Hayashi  
Leader

Consumer Technology Division



**JAB**  
Testing  
RTL02610

- 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.**

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13-EM-F0429

## REVISION HISTORY

**Original Test Report No.: 12054556S-A**

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12054556S-A	February 22, 2018	-	-
1	12054556S-A-R1	May 25, 2018	5	Correction of Worst margin

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## **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 : Hiroaki Suzuki

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Watch  
Model No. : MTG-B1000  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : Typical: Nom : DC 2.5 V, Min.: DC 1.9 V, Max.: DC 2.7 V  
CW5526 (Module): Min.: DC 1.9 V, Max.: DC 3.3 V  
Receipt Date of Sample : December 25, 2017  
Country of Mass-production : Japan, China, Thailand  
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: MTG-B1000 (referred to as the EUT in this report) is a Watch.

\* MTG-B1000 has alternative name as R012.

### **General Specification**

Clock frequency(ies) in the system : 26 MHz, 32.768 kHz

### **Radio Specification**

<Bluetooth part>

Equipment Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Type of Modulation : GFSK  
Channel spacing : 2 MHz  
Antenna Type : Pattern Antenna (Mono Pole)  
Antenna Gain : -2.0 dBi

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on February 2, 2018 and effective March 5, 2018

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

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

### **3.2 Procedures and results**

Item *1)	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v04	FCC: Section15.247(d)	5.9 dB 9920.000 MHz, AV, Vertical, Tx BT LE 2480 MHz	Complied	Radiated (above 30 MHz) *2)
	IC: RSS-Gen 6.13	IC: 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) Regarding as other items, refer to the original test report: 11757840S-A-R2. (Tested model: MRG-B1000)					
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v04 12.2.7.					

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

#### **FCC Part 15.31 (e)**

The EUT provides stable voltage (DC 1.35 V) 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 antenna requirement.

### **3.3 Addition to standard**

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

### 3.4 Uncertainty

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

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.3 dB	4.3 dB	4.3 dB	-	-
	200 MHz-1 GHz	5.9 dB	5.9 dB	5.9 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

#### Radiated emission test

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

### 3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

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JAB Accreditation No. RTL02610

FCC Test Firm Registration Number: 839876

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

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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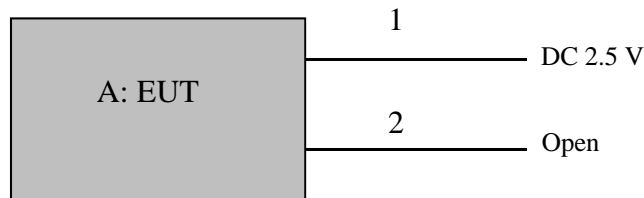
Facsimile : +81 463 50 6401

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

### **4.1 Operating Mode(s)**

Mode	Frequency	Remarks*
Bluetooth Low Energy	2402 MHz, 2440 MHz, 2480 MHz	PN9
*Power of the EUT was set by the software as follows; - Power Setting: Fixed - Software: BLE RF Test Version 9.9  *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.		

### **4.2 Configuration and peripherals**



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

#### **Description of EUT**

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Watch	MTG-B1000	54	CASIO COMPUTER CO., LTD.	EUT

#### **List of cables used**

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.1 + 1.5	Unshielded	Unshielded	*1)
2	Signal Cable	0.1	Unshielded	Unshielded	*2)

\*1) Cable for test operation

\*2) Cable for system reset during the development, not used for the product

## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

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

[For below 1 GHz]

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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

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

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

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

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

### **Test Antennas are used as below;**

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: <u>12.2.5.2</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results. *4)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.97 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3.97 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)

\*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".

\*2) Distance Factor:  $20 \times \log(3.97 \text{ m} / 3.0 \text{ m}) = 2.44 \text{ dB}$

\*3) Distance Factor:  $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

\*4) Duty factor: Refer to the original test report: 11757840S-A-R2.

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

Antenna polarization	Carrier	Spurious (Below 1 GHz)	Spurious (1 GHz -13 GHz)	Spurious (13 GHz -26.5 GHz)
Horizontal	Z	X	X	X
Vertical	Y	X	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

## APPENDIX 1: Test data

### Radiated Spurious Emission

Report No. 12054556S-A-R1  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber No.1 No.1  
Date January 14, 2018 January 13, 2018  
Temperature / Humidity 20 deg. C / 32 % RH 22 deg. C / 35 % RH  
Engineer Yosuke Ishikawa Shiro Kobayashi  
(18 GHz -26.5 GHz) (1 GHz -18 GHz)  
(30 MHz- 1 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.	103.959	QP	21.22	10.52	8.19	31.80	0.00	8.13	43.50	35.3	300	124	
Hori.	147.643	QP	21.28	14.58	8.78	31.77	0.00	12.87	43.50	30.6	200	352	
Hori.	601.573	QP	21.27	19.16	8.60	31.95	0.00	17.08	46.00	28.9	150	234	
Hori.	770.308	QP	21.97	20.45	9.37	31.88	0.00	19.91	46.00	26.0	100	245	
Hori.	944.821	QP	20.44	22.15	10.13	30.96	0.00	21.76	46.00	24.2	100	330	
Hori.	2390.000	PK	49.06	27.14	14.19	44.13	2.44	48.70	73.90	25.2	158	222	
Hori.	4804.000	PK	52.31	31.13	6.78	44.45	2.44	48.21	73.90	25.7	109	302	
Hori.	7206.000	PK	46.72	36.35	8.38	43.99	2.44	49.90	73.90	24.0	150	0	
Hori.	9608.000	PK	49.21	38.11	9.38	43.83	2.44	55.31	73.90	18.6	150	0	
Vert.	35.283	QP	21.45	16.03	7.15	31.83	0.00	12.80	40.00	27.2	100	41	
Vert.	190.523	QP	21.15	16.43	9.01	31.77	0.00	14.82	43.50	28.6	100	76	
Vert.	743.182	QP	21.14	20.20	9.26	31.95	0.00	18.65	46.00	27.3	100	158	
Vert.	951.852	QP	21.16	22.18	10.15	30.90	0.00	22.59	46.00	23.4	100	211	
Vert.	2390.000	PK	48.46	27.14	14.19	44.13	2.44	48.10	73.90	25.8	110	254	
Vert.	4804.000	PK	52.00	31.13	6.78	44.45	2.44	47.90	73.90	26.0	135	356	
Vert.	7206.000	PK	47.12	36.35	8.38	43.99	2.44	50.30	73.90	23.6	150	0	
Vert.	9608.000	PK	48.62	38.11	9.38	43.83	2.44	54.72	73.90	19.2	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.44 dB

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

#### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	39.47	27.14	14.19	44.13	1.71	2.44	40.82	53.90	13.1	*1)
Hori.	4804.000	AV	45.81	31.13	6.78	44.45	1.71	2.44	43.42	53.90	10.5	
Hori.	7206.000	AV	37.62	36.35	8.38	43.99	1.71	2.44	42.51	53.90	11.4	
Hori.	9608.000	AV	39.13	38.11	9.38	43.83	1.71	2.44	46.94	53.90	7.0	
Vert.	2390.000	AV	39.32	27.14	14.19	44.13	1.71	2.44	40.67	53.90	13.2	*1)
Vert.	4804.000	AV	45.23	31.13	6.78	44.45	1.71	2.44	42.84	53.90	11.1	
Vert.	7206.000	AV	37.48	36.35	8.38	43.99	1.71	2.44	42.37	53.90	11.5	
Vert.	9608.000	AV	38.83	38.11	9.38	43.83	1.71	2.44	46.64	53.90	7.3	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.44 dB

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

Duty factor refer to "Duty factor Calculation chart" sheet.

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

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	77.06	27.18	14.20	44.14	2.44	76.74	-	-	Carrier
Hori.	2400.000	PK	45.07	27.17	14.19	44.14	2.44	44.73	56.74	12.0	
Vert.	2402.000	PK	73.90	27.18	14.20	44.14	2.44	73.58	-	-	Carrier
Vert.	2400.000	PK	43.26	27.17	14.19	44.14	2.44	42.92	53.58	10.7	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.44 dB

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

**UL Japan, Inc.**

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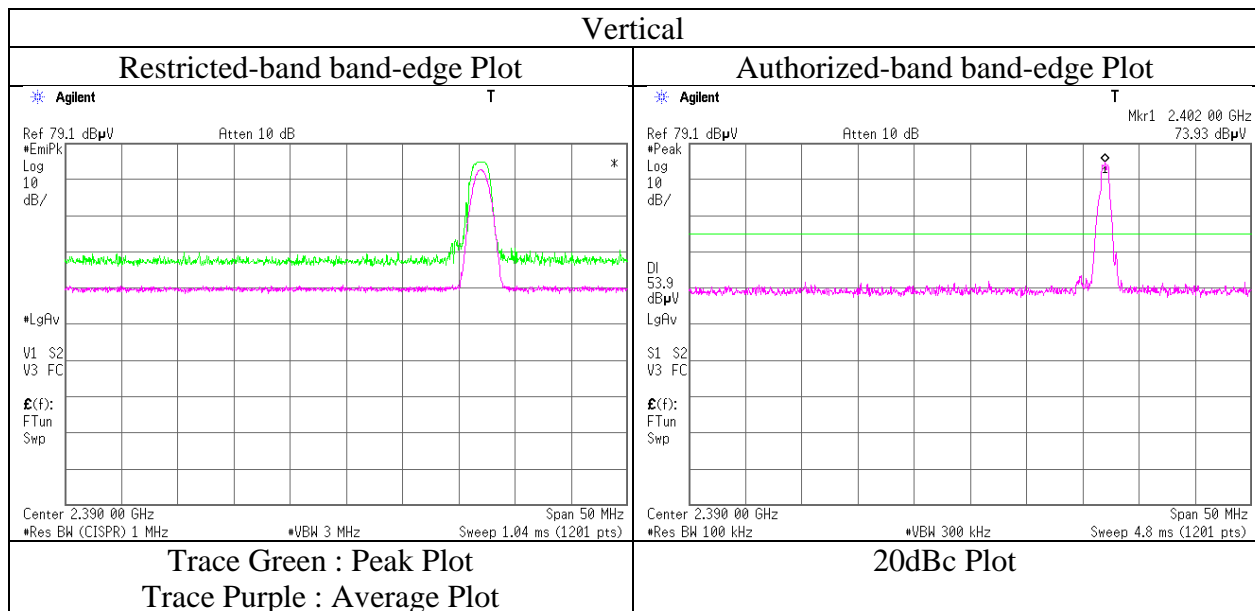
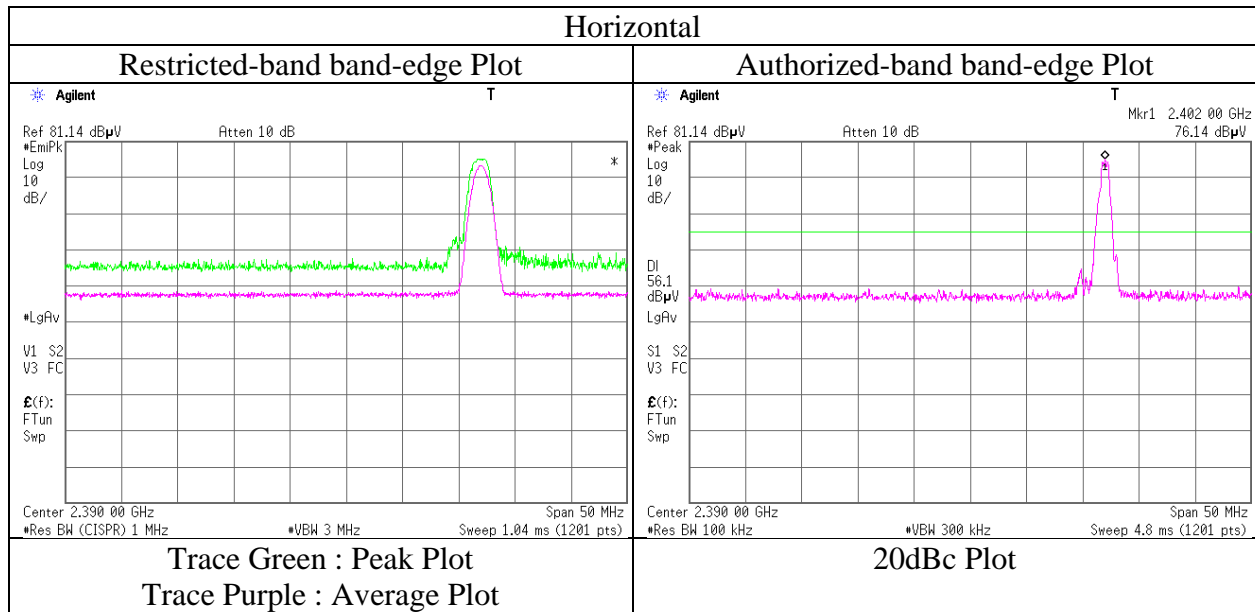
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**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Report No. 12054556S-A-R1  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber No.1  
Date January 13, 2018  
Temperature / Humidity 22 deg. C / 35 % RH  
Engineer Shiro Kobayashi  
Mode Tx BT LE 2402 MHz



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

## Radiated Spurious Emission

Report No.	12054556S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	No.1
Date	January 14, 2018	January 13, 2018
Temperature / Humidity	20 deg. C / 32 % RH	22 deg. C / 35 % RH
Engineer	Yosuke Ishikawa (18 GHz -26.5 GHz) (30 MHz- 1 GHz)	Shiro Kobayashi (1 GHz -18 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.	156.629	QP	21.25	14.84	8.92	31.77	0.00	13.24	43.50	30.2	200	253	
Hori.	589.386	QP	21.12	18.99	8.55	31.95	0.00	16.71	46.00	29.2	150	194	
Hori.	746.276	QP	20.95	20.23	9.28	31.95	0.00	18.51	46.00	27.4	100	83	
Hori.	824.847	QP	20.77	21.04	9.62	31.69	0.00	19.74	46.00	26.2	100	35	
Hori.	4880.000	PK	51.00	31.30	6.86	44.48	2.44	47.12	73.90	26.8	104	297	
Hori.	7320.000	PK	47.22	36.51	8.50	44.03	2.44	50.64	73.90	23.3	150	0	
Hori.	9760.000	PK	47.33	38.36	9.49	43.85	2.44	53.77	73.90	20.1	150	0	
Vert.	31.891	QP	21.57	16.96	7.07	31.83	0.00	13.77	40.00	26.2	100	274	
Vert.	166.773	QP	21.16	15.31	8.98	31.77	0.00	13.68	43.50	29.8	100	121	
Vert.	181.080	QP	21.42	16.08	8.97	31.77	0.00	14.70	43.50	28.8	100	156	
Vert.	871.118	QP	20.75	21.63	9.85	31.49	0.00	20.74	46.00	25.2	100	358	
Vert.	919.254	QP	20.47	22.07	10.05	31.18	0.00	21.41	46.00	24.5	100	311	
Vert.	4880.000	PK	50.78	31.30	6.86	44.48	2.44	46.90	73.90	27.0	112	358	
Vert.	7320.000	PK	47.25	36.51	8.50	44.03	2.44	50.67	73.90	23.2	150	0	
Vert.	9760.000	PK	48.11	38.36	9.49	43.85	2.44	54.55	73.90	19.4	150	0	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

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

### 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	44.00	31.30	6.86	44.48	1.71	2.44	41.83	53.90	12.1	
Hori.	7320.000	AV	37.76	36.51	8.50	44.03	1.71	2.44	42.89	53.90	11.0	
Hori.	9760.000	AV	38.32	38.36	9.49	43.85	1.71	2.44	46.47	53.90	7.4	
Vert.	4880.000	AV	43.18	31.30	6.86	44.48	1.71	2.44	41.01	53.90	12.9	
Vert.	7320.000	AV	38.06	36.51	8.50	44.03	1.71	2.44	43.19	53.90	10.7	
Vert.	9760.000	AV	38.13	38.36	9.49	43.85	1.71	2.44	46.28	53.90	7.6	

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$

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

Duty factor refer to "Duty factor Calculation chart" sheet.

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

## Radiated Spurious Emission

Report No.	12054556S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	No.1
Date	January 14, 2018	January 13, 2018
Temperature / Humidity	20 deg. C / 32 % RH	22 deg. C / 35 % RH
Engineer	Yosuke Ishikawa (18 GHz -26.5 GHz) (30 MHz- 1 GHz)	Shiro Kobayashi (1 GHz -18 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.	165.457	QP	21.18	15.24	8.97	31.77	0.00	13.62	43.50	29.8	300	102	
Hori.	171.050	QP	21.42	15.55	8.98	31.77	0.00	14.18	43.50	29.3	150	64	
Hori.	606.360	QP	21.17	19.19	8.62	31.96	0.00	17.02	46.00	28.9	100	217	
Hori.	951.061	QP	20.22	22.17	10.15	30.91	0.00	21.63	46.00	24.3	100	25	
Hori.	2483.500	PK	50.10	27.45	14.28	44.16	2.44	50.11	73.90	23.8	132	220	
Hori.	4960.000	PK	50.00	31.48	6.93	44.51	2.44	46.34	73.90	27.6	127	336	
Hori.	7440.000	PK	48.06	36.68	8.65	44.08	2.44	51.75	73.90	22.2	150	0	
Hori.	9920.000	PK	48.52	38.63	9.60	43.87	2.44	55.32	73.90	18.6	150	0	
Vert.	32.382	QP	21.80	16.83	7.08	31.83	0.00	13.88	40.00	26.1	100	295	
Vert.	183.415	QP	21.12	16.17	8.97	31.77	0.00	14.49	43.50	29.0	100	54	
Vert.	539.252	QP	20.96	18.24	8.36	31.95	0.00	15.61	46.00	30.3	100	277	
Vert.	786.678	QP	21.15	20.60	9.44	31.83	0.00	19.36	46.00	26.6	100	114	
Vert.	889.322	QP	21.64	21.86	9.95	31.40	0.00	22.05	46.00	23.9	100	101	
Vert.	2483.500	PK	48.38	27.45	14.28	44.16	2.44	48.39	73.90	25.5	109	30	
Vert.	4960.000	PK	49.68	31.48	6.93	44.51	2.44	46.02	73.90	27.9	115	357	
Vert.	7440.000	PK	49.11	36.68	8.65	44.08	2.44	52.80	73.90	21.1	150	0	
Vert.	9920.000	PK	49.32	38.63	9.60	43.87	2.44	56.12	73.90	17.8	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.44 dB

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

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	39.52	27.45	14.28	44.16	1.71	2.44	41.24	53.90	12.7	*1)
Hori.	4960.000	AV	42.83	31.48	6.93	44.51	1.71	2.44	40.88	53.90	13.0	
Hori.	7440.000	AV	39.21	36.68	8.65	44.08	1.71	2.44	44.61	53.90	9.3	
Hori.	9920.000	AV	39.32	38.63	9.60	43.87	1.71	2.44	47.83	53.90	6.1	
Vert.	2483.500	AV	39.48	27.45	14.28	44.16	1.71	2.44	41.20	53.90	12.7	*1)
Vert.	4960.000	AV	42.32	31.48	6.93	44.51	1.71	2.44	40.37	53.90	13.5	
Vert.	7440.000	AV	39.31	36.68	8.65	44.08	1.71	2.44	44.71	53.90	9.2	
Vert.	9920.000	AV	39.51	38.63	9.60	43.87	1.71	2.44	48.02	53.90	5.9	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.44 dB

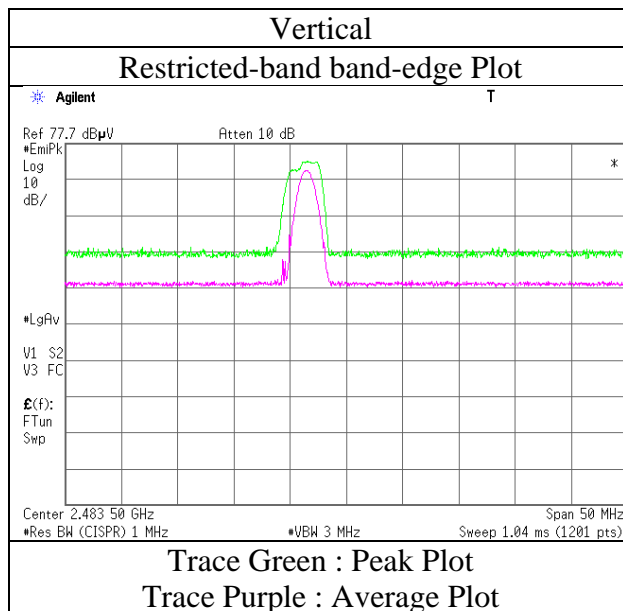
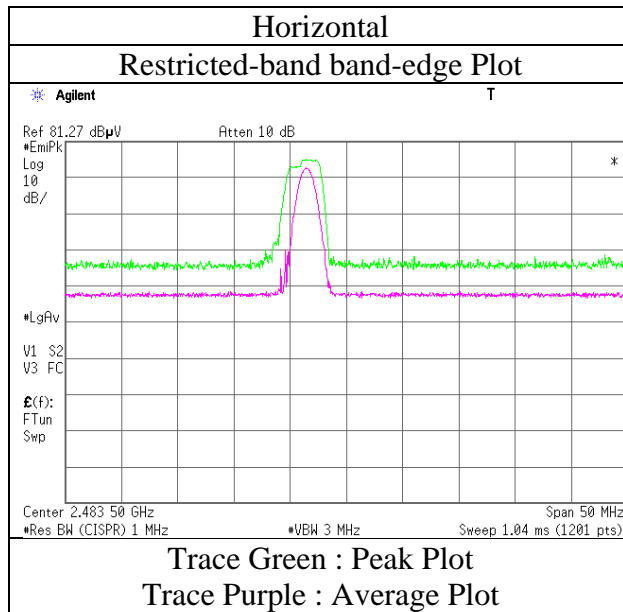
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

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

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

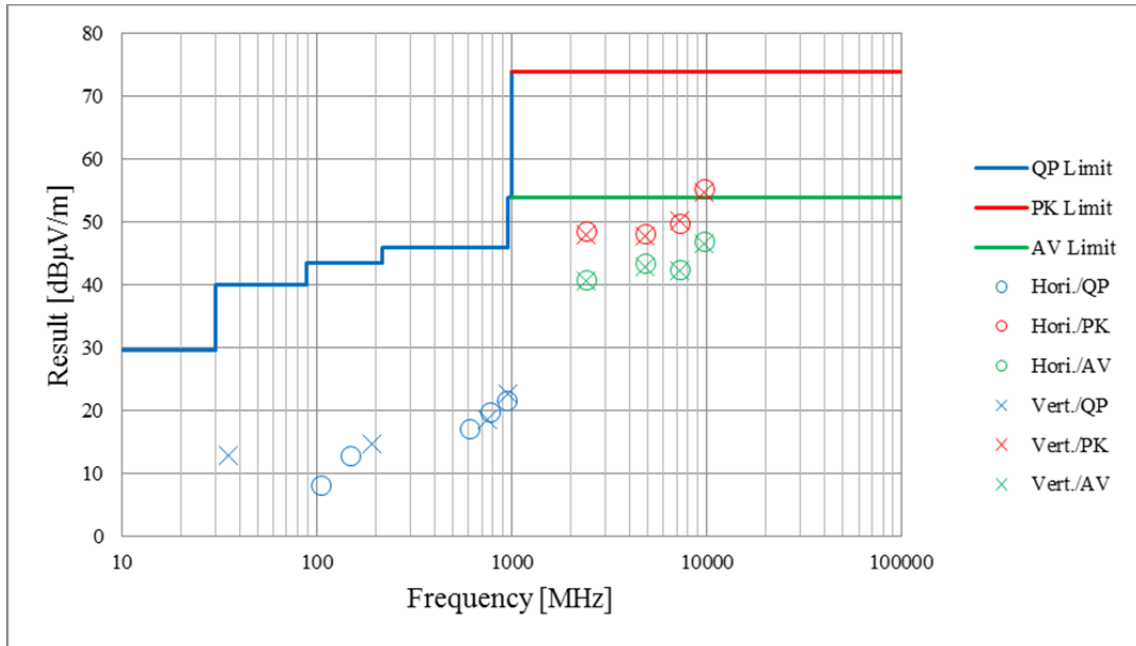
Report No.	12054556S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	January 13, 2018
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 2480 MHz



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

**Radiated Spurious Emission**  
**(Plot data, Worst case)**

Report No.	12054556S-A-R1	No.1
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	
Date	January 14, 2018	January 13, 2018
Temperature / Humidity	20 deg. C / 32 % RH	22 deg. C / 35 % RH
Engineer	Yosuke Ishikawa (18 GHz -26.5 GHz) (30 MHz- 1 GHz)	Shiro Kobayashi (1 GHz -18 GHz)
Mode	Tx BT LE 2402 MHz	



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

## **APPENDIX 2: Test instruments**

### **Test Instruments**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-03 7	RE	2017/01/08 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2017/08/14 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2017/10/30 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR )	1	RE	2017/07/20 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,C E, RFLMF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2017/10/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2017/07/11 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2017/03/17 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2017/03/23 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K M SKMS	-	RE	2017/04/20 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2017/02/09 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2017/12/14 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2017/08/24 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2017/10/21 * 12
SCC-A1/A3/A5 /A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhn er/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SCC-A2/A4/A6 /A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhn er/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2017/12/10 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2017/03/23 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2017/06/09 * 12

**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: RE: Radiated Emission test**

**UL Japan, Inc.**

**Shonan EMC Lab.**

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