



RADIO TEST REPORT

Test Report No. : 12107810S-A

Applicant : CASIO COMPUTER CO., LTD.
Type of Equipment : Watch
Model No. : OCW-S4000
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.
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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)

Date of test: January 9 and 10, 2018

Representative test engineer:

K. Takeyama

Kazutaka Takeyama
Engineer
Consumer Technology Division

Approved by:

A. Hayashi

Akio Hayashi
Leader
Consumer Technology Division



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

UL Japan, Inc.

Shonan EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 12107810S-A

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CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	7
SECTION 5: Radiated Spurious Emission	8
APPENDIX 1: Test data	10
Radiated Spurious Emission	10
APPENDIX 2: Test instruments	16
APPENDIX 3: Photographs of test setup	17
Radiated Spurious Emission	17
Worst Case Position	18

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.	:	OCW-S4000
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: OCW-S4000 (referred to as the EUT in this report) is a Watch.

Model: OCW-S4000 has a similar model: OCW-T3000.

The differences between OCW-S4000 and OCW-T3000 are design of watch face (display) and design of enclosure only. Therefore, these differences have no influence to mechanical, electrical and radio condition of Bluetooth Watches.

* OCW-S4000 and OCW-T3000 has alternative name as R012.

General Specification

Clock frequency(ies) in the system	:	26 MHz, 32.768 kHz
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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)	7.0 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 $k=2$.

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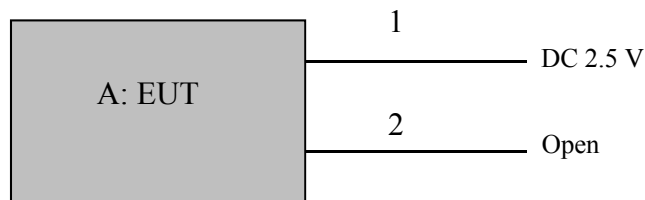
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SECTION 4: Operation of E.U.T. during testing

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	OCW-S4000	08	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

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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	Y	X	X	X
Vertical	Z	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. 12107810S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date January 9, 2018 January 10, 2018
Temperature / Humidity 22 deg. C / 35 % RH 20 deg. C / 33 % RH
Engineer Kazutaka Takeyama Kazutaka Takeyama
(1 GHz -26.5 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.	104.000	QP	23.00	10.53	8.19	31.80	0.00	9.92	43.50	33.5	300	161	
Hori.	147.623	QP	22.80	14.57	8.78	31.77	0.00	14.38	43.50	29.1	300	134	
Hori.	601.066	QP	23.10	19.16	8.60	31.95	0.00	18.91	46.00	27.0	150	2	
Hori.	770.469	QP	22.90	20.45	9.37	31.88	0.00	20.84	46.00	25.1	100	4	
Hori.	944.843	QP	22.50	22.15	10.13	30.96	0.00	23.82	46.00	22.1	100	95	
Hori.	2390.000	PK	48.30	27.14	14.19	44.13	2.44	47.94	73.90	25.9	100	107	
Hori.	4804.000	PK	52.40	31.13	6.78	44.45	2.44	48.30	73.90	25.6	100	7	
Hori.	7206.000	PK	47.10	36.35	8.38	43.99	2.44	50.28	73.90	23.6	100	0	
Hori.	9608.000	PK	48.60	38.11	9.38	43.83	2.44	54.70	73.90	19.2	100	0	
Vert.	35.277	QP	23.00	16.04	7.15	31.83	0.00	14.36	40.00	25.6	100	289	
Vert.	190.319	QP	22.50	16.43	9.00	31.77	0.00	16.16	43.50	27.3	100	267	
Vert.	743.142	QP	22.80	20.20	9.26	31.95	0.00	20.31	46.00	25.6	100	288	
Vert.	951.778	QP	22.50	22.18	10.15	30.90	0.00	23.93	46.00	22.0	100	358	
Vert.	2390.000	PK	49.30	27.14	14.19	44.13	2.44	48.94	73.90	24.9	235	177	
Vert.	4804.000	PK	52.20	31.13	6.78	44.45	2.44	48.10	73.90	25.8	100	2	
Vert.	7206.000	PK	47.00	36.35	8.38	43.99	2.44	50.18	73.90	23.7	100	0	
Vert.	9608.000	PK	47.70	38.11	9.38	43.83	2.44	53.80	73.90	20.1	100	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	38.10	27.14	14.19	44.13	1.71	2.44	39.45	53.90	14.5	*1)
Hori.	4804.000	AV	45.40	31.13	6.78	44.45	1.71	2.44	43.01	53.90	10.9	
Hori.	7206.000	AV	36.90	36.35	8.38	43.99	1.71	2.44	41.79	53.90	12.1	
Hori.	9608.000	AV	38.00	38.11	9.38	43.83	1.71	2.44	45.81	53.90	8.1	
Vert.	2390.000	AV	40.00	27.14	14.19	44.13	1.71	2.44	41.35	53.90	12.6	*1)
Vert.	4804.000	AV	44.20	31.13	6.78	44.45	1.71	2.44	41.81	53.90	12.1	
Vert.	7206.000	AV	37.30	36.35	8.38	43.99	1.71	2.44	42.19	53.90	11.7	
Vert.	9608.000	AV	37.80	38.11	9.38	43.83	1.71	2.44	45.61	53.90	8.3	

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.

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	80.00	27.18	14.20	44.14	2.44	79.68	-	-	
Hori.	2400.000	PK	41.30	27.17	14.19	44.14	2.44	40.96	59.68	18.7	
Vert.	2402.000	PK	77.70	27.18	14.20	44.14	2.44	77.38	-	-	
Vert.	2400.000	PK	40.00	27.17	14.19	44.14	2.44	39.66	57.38	17.7	

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

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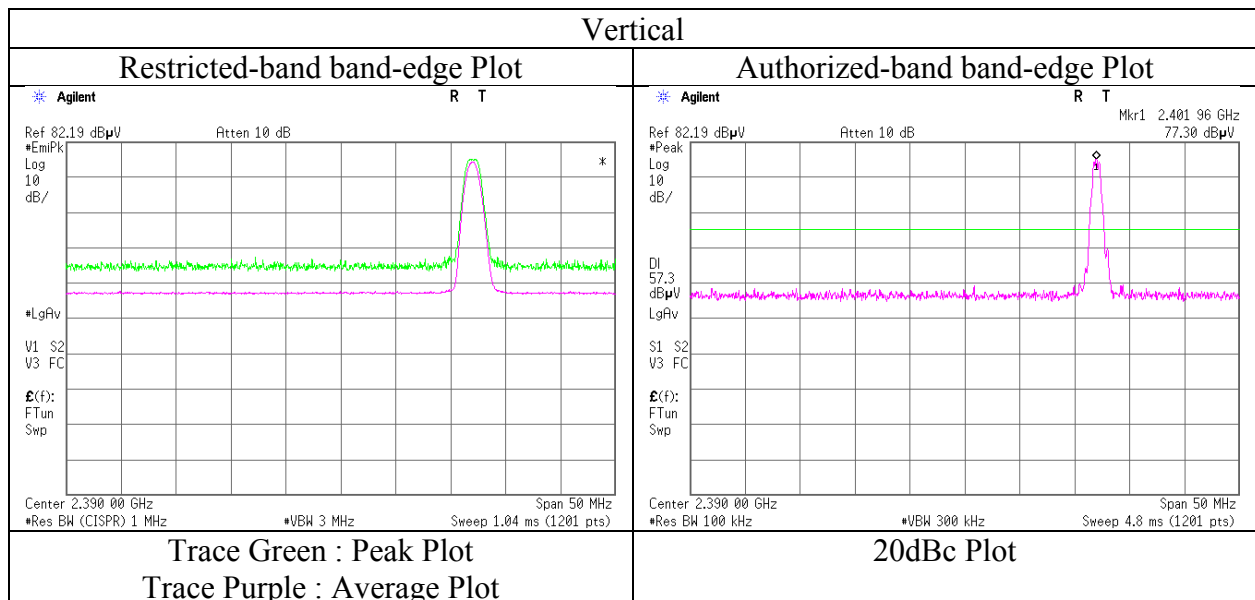
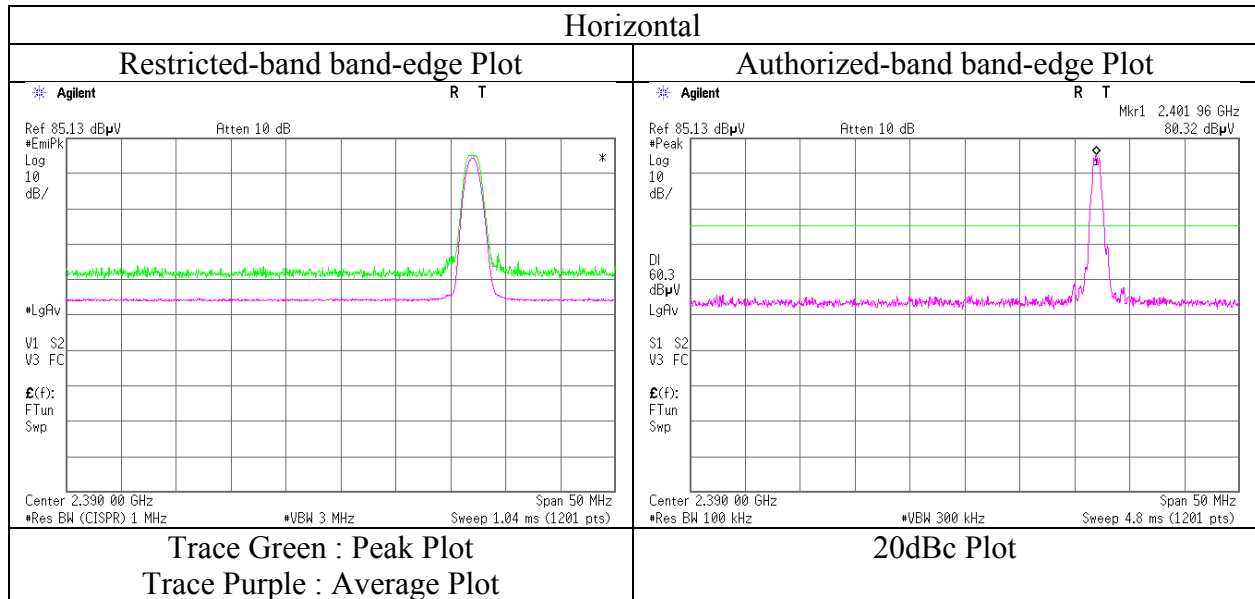
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12107810S-A	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	
Date	January 9, 2018	January 10, 2018
Temperature / Humidity	22 deg. C / 35 % RH	20 deg. C / 33 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(1 GHz -26.5 GHz)	(30 MHz- 1 GHz)
Mode	Tx BT LE 2402 MHz	



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

Radiated Spurious Emission

Report No. 12107810S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date January 9, 2018 January 10, 2018
Temperature / Humidity 22 deg. C / 35 % RH 20 deg. C / 33 % RH
Engineer Kazutaka Takeyama Kazutaka Takeyama
(1 GHz -26.5 GHz) (30 MHz- 1 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.	156.480	QP	22.70	14.84	8.91	31.77	0.00	14.68	43.50	28.8	300	299	
Hori.	589.399	QP	22.90	18.99	8.55	31.95	0.00	18.49	46.00	27.5	100	246	
Hori.	746.150	QP	22.90	20.22	9.28	31.95	0.00	20.45	46.00	25.5	150	2	
Hori.	824.742	QP	22.80	21.04	9.62	31.69	0.00	21.77	46.00	24.2	100	254	
Hori.	4880.000	PK	53.00	31.30	6.86	44.48	2.44	49.12	73.90	24.7	100	11	
Hori.	7320.000	PK	46.30	36.51	8.50	44.03	2.44	49.72	73.90	24.1	100	0	
Hori.	9760.000	PK	47.40	38.36	9.49	43.85	2.44	53.84	73.90	20.0	100	0	
Vert.	31.887	QP	22.90	16.96	7.07	31.83	0.00	15.10	40.00	24.9	100	155	
Vert.	166.870	QP	22.70	15.32	8.98	31.77	0.00	15.23	43.50	28.2	100	183	
Vert.	181.315	QP	22.80	16.09	8.97	31.77	0.00	16.09	43.50	27.4	100	33	
Vert.	871.181	QP	22.70	21.63	9.85	31.49	0.00	22.69	46.00	23.3	100	13	
Vert.	919.260	QP	22.60	22.07	10.05	31.18	0.00	23.54	46.00	22.4	100	359	
Vert.	4880.000	PK	51.00	31.30	6.86	44.48	2.44	47.12	73.90	26.7	100	2	
Vert.	7320.000	PK	47.70	36.51	8.50	44.03	2.44	51.12	73.90	22.7	100	0	
Vert.	9760.000	PK	48.50	38.36	9.49	43.85	2.44	54.94	73.90	18.9	100	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	44.60	31.30	6.86	44.48	1.71	2.44	42.43	53.90	11.5	
Hori.	7320.000	AV	37.30	36.51	8.50	44.03	1.71	2.44	42.43	53.90	11.5	
Hori.	9760.000	AV	38.00	38.36	9.49	43.85	1.71	2.44	46.15	53.90	7.8	
Vert.	4880.000	AV	42.10	31.30	6.86	44.48	1.71	2.44	39.93	53.90	14.0	
Vert.	7320.000	AV	37.10	36.51	8.50	44.03	1.71	2.44	42.23	53.90	11.7	
Vert.	9760.000	AV	38.10	38.36	9.49	43.85	1.71	2.44	46.25	53.90	7.7	

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. 12107810S-A
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date January 9, 2018 January 10, 2018
Temperature / Humidity 22 deg. C / 35 % RH 20 deg. C / 33 % RH
Engineer Kazutaka Takeyama Kazutaka Takeyama
(1 GHz -26.5 GHz) (30 MHz- 1 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.	117.343	QP	22.60	12.76	8.18	31.79	0.00	11.75	43.50	31.7	300	240	
Hori.	165.664	QP	22.70	15.25	8.97	31.77	0.00	15.15	43.50	28.3	300	218	
Hori.	606.356	QP	23.10	19.19	8.62	31.96	0.00	18.95	46.00	27.0	100	242	
Hori.	950.970	QP	22.50	22.17	10.15	30.91	0.00	23.91	46.00	22.0	150	0	
Hori.	2483.500	PK	49.30	27.45	14.28	44.16	2.44	49.31	73.90	24.5	100	15	
Hori.	4960.000	PK	52.00	31.48	6.93	44.51	2.44	48.34	73.90	25.5	105	2	
Hori.	7440.000	PK	47.80	36.68	8.65	44.08	2.44	51.49	73.90	22.4	100	0	
Hori.	9920.000	PK	48.10	38.63	9.60	43.87	2.44	54.90	73.90	19.0	100	0	
Vert.	32.553	QP	23.00	16.78	7.08	31.83	0.00	15.03	40.00	24.9	100	352	
Vert.	183.687	QP	22.70	16.18	8.98	31.77	0.00	16.09	43.50	27.4	100	32	
Vert.	539.240	QP	22.80	18.24	8.36	31.95	0.00	17.45	46.00	28.5	100	275	
Vert.	786.015	QP	22.90	20.59	9.43	31.83	0.00	21.09	46.00	24.9	100	358	
Vert.	889.189	QP	22.60	21.86	9.95	31.40	0.00	23.01	46.00	22.9	100	306	
Vert.	2483.500	PK	49.10	27.45	14.28	44.16	2.44	49.11	73.90	24.7	110	198	
Vert.	4960.000	PK	49.70	31.48	6.93	44.51	2.44	46.04	73.90	27.8	110	101	
Vert.	7440.000	PK	48.10	36.68	8.65	44.08	2.44	51.79	73.90	22.1	100	0	
Vert.	9920.000	PK	48.50	38.63	9.60	43.87	2.44	55.30	73.90	18.6	100	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.	2483.500	AV	39.00	27.45	14.28	44.16	1.71	2.44	40.72	53.90	13.2	*1)
Hori.	4960.000	AV	44.40	31.48	6.93	44.51	1.71	2.44	42.45	53.90	11.5	
Hori.	7440.000	AV	38.00	36.68	8.65	44.08	1.71	2.44	43.40	53.90	10.5	
Hori.	9920.000	AV	38.10	38.63	9.60	43.87	1.71	2.44	46.61	53.90	7.3	
Vert.	2483.500	AV	39.30	27.45	14.28	44.16	1.71	2.44	41.02	53.90	12.9	*1)
Vert.	4960.000	AV	42.60	31.48	6.93	44.51	1.71	2.44	40.65	53.90	13.3	
Vert.	7440.000	AV	37.90	36.68	8.65	44.08	1.71	2.44	43.30	53.90	10.6	
Vert.	9920.000	AV	38.40	38.63	9.60	43.87	1.71	2.44	46.91	53.90	7.0	

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)

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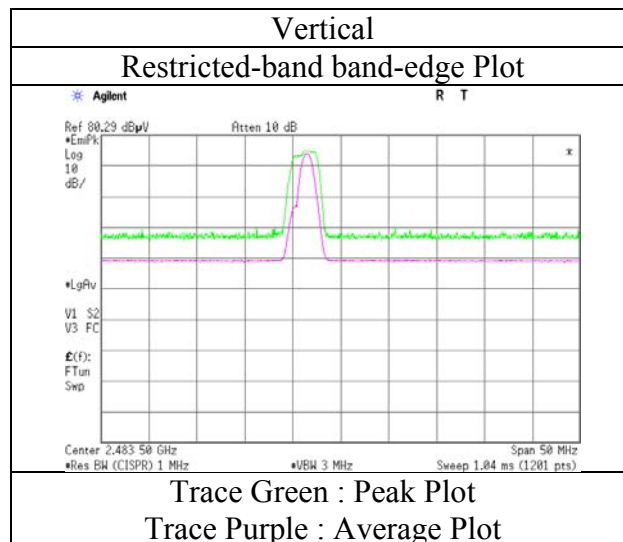
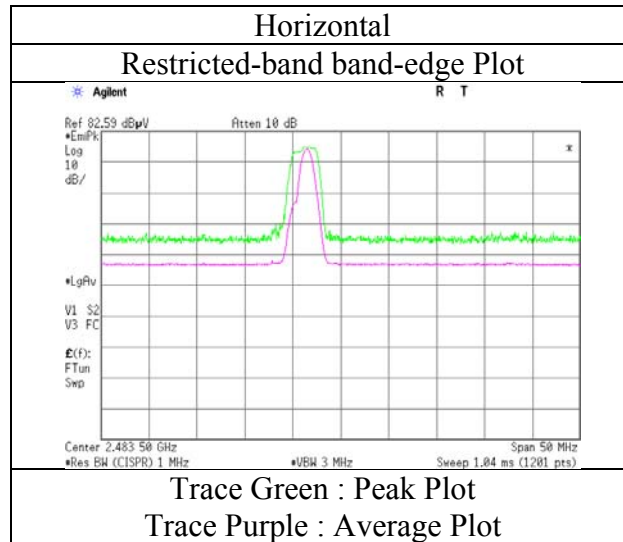
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

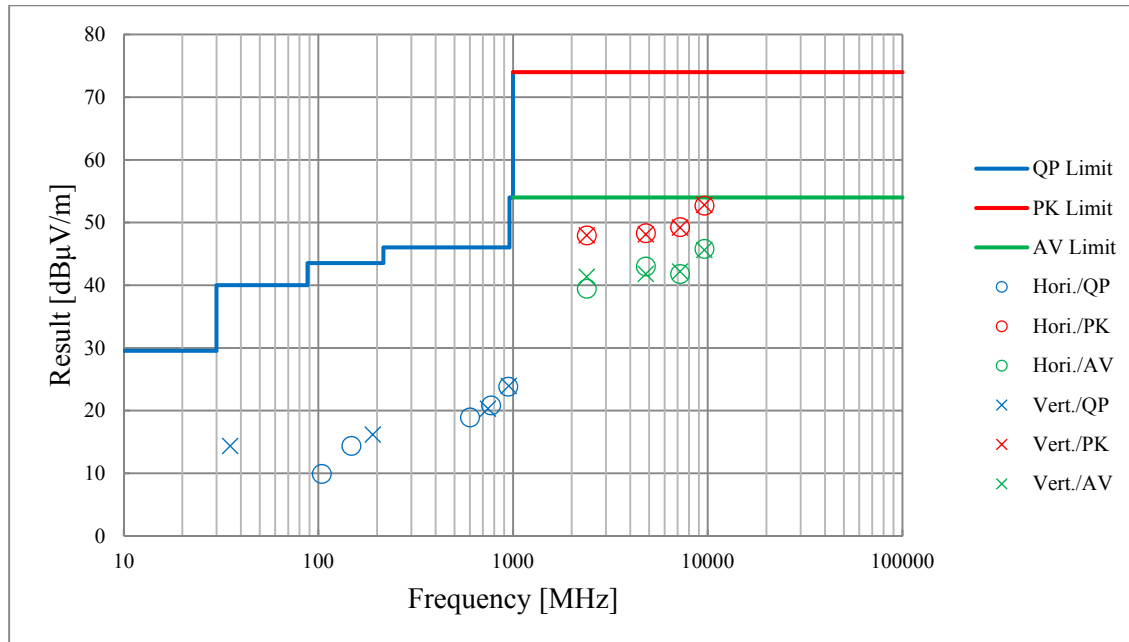
Report No.	12107810S-A
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	January 9, 2018 January 10, 2018
Temperature / Humidity	22 deg. C / 35 % RH 20 deg. C / 33 % RH
Engineer	Kazutaka Takeyama Kazutaka Takeyama
	(1 GHz -26.5 GHz) (30 MHz- 1 GHz)
Mode	Tx BT LE 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12107810S-A	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	
Date	January 9, 2018	January 10, 2018
Temperature / Humidity	22 deg. C / 35 % RH	20 deg. C / 33 % RH
Engineer	Kazutaka Takeyama	Kazutaka Takeyama
	(1 GHz -26.5 GHz)	(30 MHz- 1 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-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/SRS E-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhn er/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/ 141PE/141PE/14 1PE/141PE/NS4 906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SCC-A2/A4/A6/ A7/A8/A13/SRS E-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhn er/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/ 141PE/141PE/14 1PE/141PE/NS4 906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2017/12/10 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2017/10/30 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2017/04/12 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2017/06/09 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE, CE,RFI,MF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2017/10/16 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	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
SAEC-01(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSW R)	1	RE	2017/07/20 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S005	RE	2017/01/08 * 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-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2017/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2017/09/22 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	-	RE	2017/04/20 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2017/03/23 * 12

*Hyphens for 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: RE: Radiated Emission test

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