




RADIO TEST REPORT


Test Report No.: 12403128S-B-R4

Applicant : **Pioneer Corporation**
Type of Equipment : **Pedaling Monitor Sensor**
Model No. : **SGY-PM930HL**
FCC ID : **AJDK108**
Test regulation : **FCC Part 15 Subpart C: 2018**
(* ANT+ part)
Test Result : **Complied**

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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. This report is a revised version of 12403128S-B-R3. 12403128S-B-R3 is replaced with this report.

Date of test: August 8 to 17, 2018

Representative test engineer: 
Kazuya Noda
Engineer
Consumer Technology Division

Approved by : 
Hikaru Shirasawa
Engineer
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".

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Shonan EMC Lab.

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

13-EM-F0429

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SECTION 1: Customer information

Company Name : Pioneer Corporation
Address : 25-1 Yamada, Kawagoe-shi, Saitama, 350-8555, Japan
Telephone Number : +81-49-228-7787
Facsimile Number : +81-49-228-6493
Contact Person : Masahiro Sato

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

2.1 Identification of E.U.T.

Type of Equipment : Pedaling Monitor Sensor
Model No. : SGY-PM930HL
Serial No. : Refer to Clause 4.2
Rating : DC 3.0 V
Receipt Date of Sample : August 8, 2018
Country of Mass-production : Japan
Condition of EUT : Production prototype
Modification of EUT : (Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product description

Model: SGY-PM930HL (referred to as the EUT in this report) is a Pedaling Monitor Sensor.

General Specification

Clock frequency(ies) in the system : 32.768 kHz, 32 MHz

Radio Specification

ANT+

Equipment type : Transceiver
Frequency of operation : 2447 MHz, 2457 MHz
Type of modulation : GFSK
Antenna type : Planar inverted F type (SGY-PM930HL)
Antenna connector type : None
Operation temperature range : -10 deg.C to +50 deg.C.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C
FCC Part 15 final revised on June 14, 2017 and effective July 14, 2017

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.249 Operation within the bands 902 MHz - 928 MHz,
2400 MHz - 2483.5 MHz, 5725 MHz - 5875 MHz and 24.0 - 24.25 GHz

3.2 Procedures & Results

Item	Test Procedure	Specification	Deviation	Worst margin	Results
Conducted emission	FCC: ANSI C63.10-2013 IC: RSS-Gen 8.8	FCC 15.207(a) IC: RSS-Gen 8.8	N/A	N/A *1)	N/A
Electric field strength of fundamental emission	FCC: ANSI C63.10-2013 IC: RSS-Gen 6.6, 6.12	FCC 15.249(a)(e) IC: RSS-210 B.10	N/A	22.1 dB (2447.000 MHz, Horizontal, PK, Tx ANT+ 2447 MHz)	Complied
Electric field strength of spurious emission	FCC: ANSI C63.10-2013 IC: RSS-Gen 6.5, 6.6, 6.13	FCC 15.205(a)(b) FCC 15.209(a) FCC 15.249(a)(d)(e) IC: RSS-210 B.10	N/A	19.1 dB (9828.000 MHz, Vertical, PK Tx ANT+ 2457 MHz)	Complied
20dB bandwidth	FCC: ANSI C63.10-2013 IC: -	FCC 15.215 IC: -	N/A	-	Complied
Frequency tolerance	FCC: ANSI C63.10-2013 IC: RSS-Gen 6.11, 8.11	FCC 15.249(b) IC: -	N/A *2)	-	-
*1) The test is not applicable since the EUT has no AC mains.					
*2) The test is not required since this EUT does not operate with 24.05 GHz to 24.25 GHz.					
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422					
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.					

FCC Part 15.31 (e)

The test was performed with the New Battery and the stable voltage was supplied to the EUT during the tests. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99 %)	RSS-Gen 6.7	-	Conducted	-	-

Note: UL Japan's EMI Work Procedures No.13-EM-W0420 and 13-EM-W0422.

* Other than above, 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
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.5 dB	2.5 dB	2.5 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.9 dB	4.8 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 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)	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	1 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

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.90 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.04 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %

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3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

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

Telephone number : +81 463 50 6400

Facsimile number : +81 463 50 6401

JAB Accreditation No. : RTL02610

FCC Test Firm Registration Number : 839876

	IC Registration No.	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 setup, Data of EMI & Test instruments

Refer to APPENDIX.

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

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Facsimile : +81 463 50 6401

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

4.1 Operating mode

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test sequence is used: Transmitting 2447 MHz, 2457 MHz
Software: 0.001

Justification: The system was configured in typical fashion (as customer would normally use it) for testing.

4.2 Configuration of tested system



* Cabling and setup 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	Pedaling Monitor Sensor	SGY-PM930HL	RHTP600003WL *1) RHTP600002WL *2)	Pioneer	EUT
B	Battery	CR2032	-	-	-

*1) Used for Bandwidth test

*2) Used for Radiated emission test

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

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SECTION 5: Radiated emission

5.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

5.2 Test configuration

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. For above 1 GHz, EUT was placed on a polystyrene platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

Photographs of the set up are shown in APPENDIX 3.

5.3 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane at a distance of 3 m.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788. These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane. However test results were confirmed to pass against standard limit.

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3 m.

Frequency: From 9 kHz to 30 MHz at distance 3 m (Refer to Figure 2)

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg. and 135 deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 1.

Frequency: From 30 MHz to 26.5 GHz at distance 3 m (Refer to Figure 2).

The measuring antenna height was 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 intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver.

	9 kHz to 90 kHz & 110 kHz to 150 kHz *4)	90 kHz to 110 kHz *4)	150 kHz to 490 kHz *4)	490 kHz to 30 MHz *4)	30 MHz to 1 GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	10 kHz	9 kHz	120 kHz
Distance factor *1)	-80 dB	-80 dB	-80 dB	-40 dB	-
Measuring antenna	Loop antenna				Biconical (30 MHz – 200 MHz) Logperiodic (200 MHz - 1 GHz)

	above 1 GHz	
Detector Type	PK	AV *3)
IF Bandwidth	RBW: 1 MHz VBW: 3 MHz	-
Distance factor *2)	2.47 dB (1 GHz - 13 GHz) -9.54 dB (13 GHz - 40 GHz)	
Measuring antenna	Horn	

*1) FCC 15.31 (f)(2) (9 kHz-30 MHz)

Distance Factor: $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

Distance Factor: $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

*2) Distance Factor: 1 GHz - 13 GHz: $20 \times \log(3.98 \text{ m} / 3.0 \text{ m}) = 2.47 \text{ dB}$

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

*3) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector used Averaging factor (Duty factor)

*4) In the frequency range below 30 MHz, no noise had been detected since it was below floor noise level.

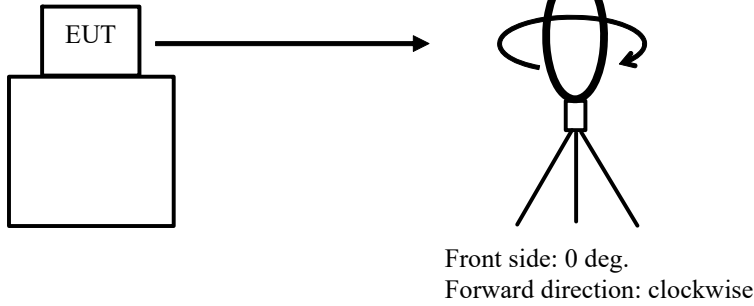
- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Combinations of the worst case

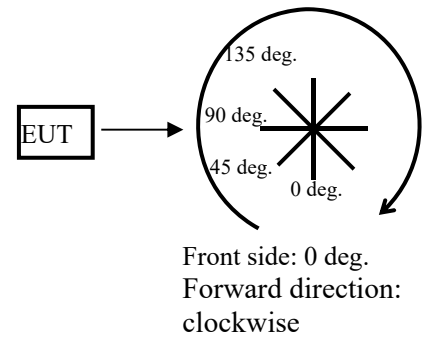
Antenna polarization	Frequency					
	Spurious 9 kHz- 30 MHz	30 MHz- 1000 MHz	1 GHz – 2.8 GHz	2.8 GHz – 13 GHz	13 GHz-18 GHz	18 GHz-26 GHz
Horizontal	X	X	X	Y	X	X
Vertical	X	X	Z	Y	X	X

Figure 1. Direction of the Loop Antenna

Side View (Vertical)



Top View (Vertical)



Top View (Horizontal)

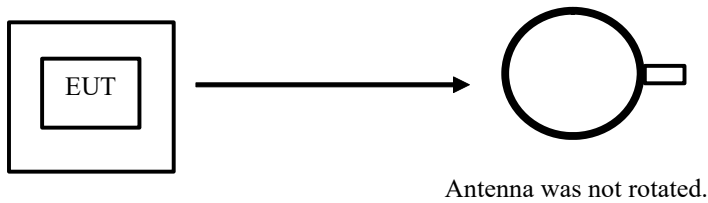
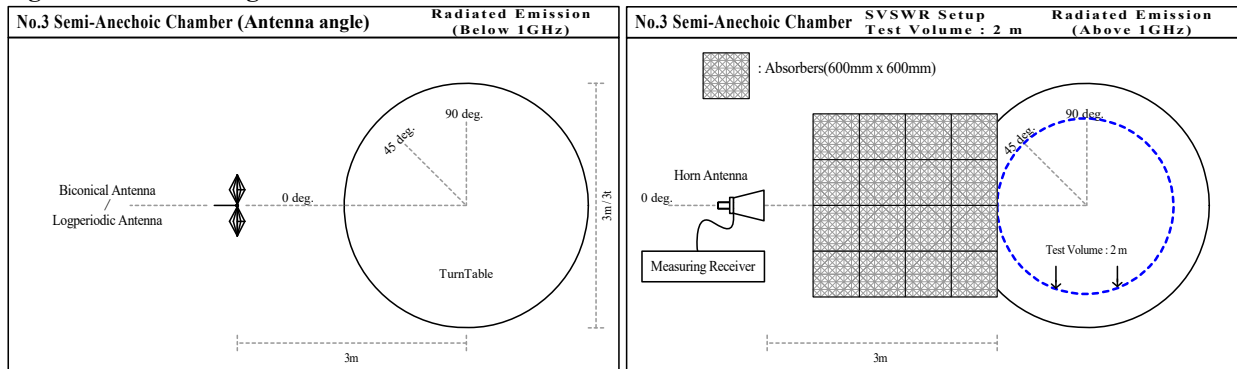


Figure 2. Antenna angle



5.4 Results

Summary of the test results : Pass

Refer to APPENDIX 1

SECTION 6: 20 dB Bandwidth & 99 % Occupied Bandwidth

Test procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	2 to 5 times of OBW.	1 to 5 % of OBW	Three times of RBW	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	Sample	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.

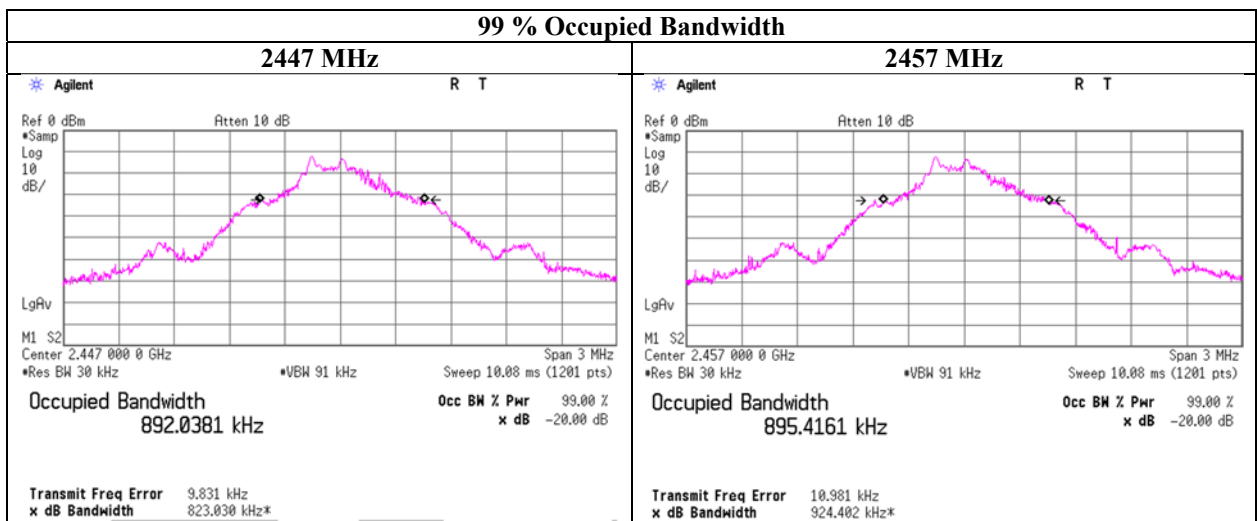
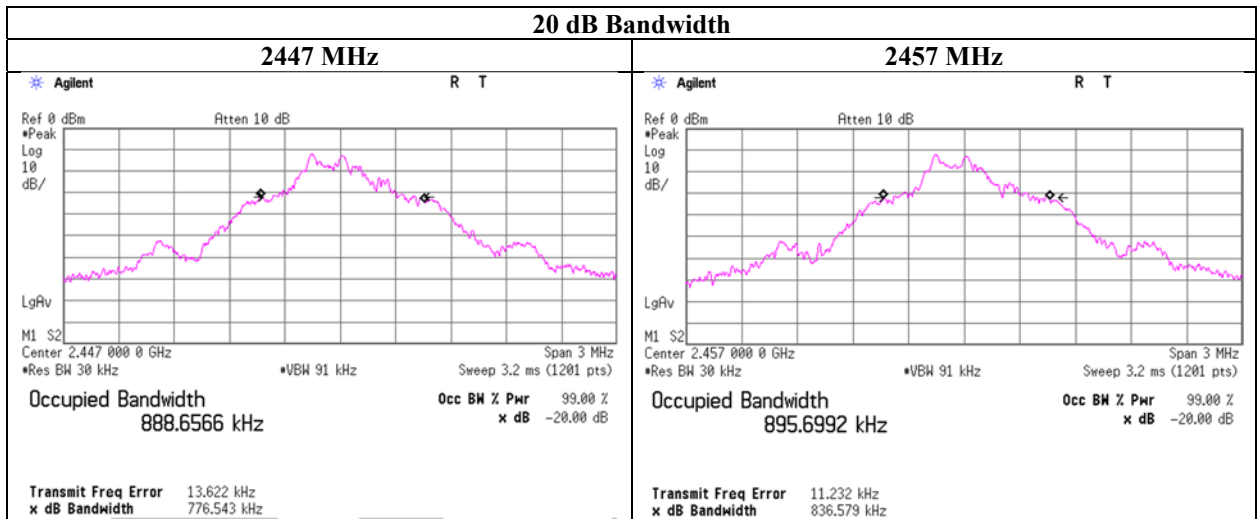
Summary of the test results:Pass
Refer to APPENDIX 1

APPENDIX 1: Data of Radio tests

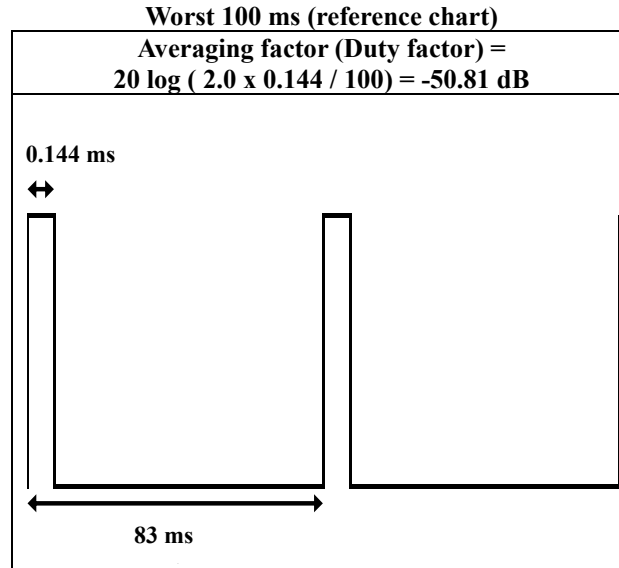
20 dB Bandwidth & 99 % Occupied Bandwidth

Report No. 12403128S-B
Test place Shonan EMC Lab. No.5 Shielded Room
Date August 8, 2018
Temperature / Humidity 26 deg. C / 51 % RH
Engineer Kazuya Noda
Mode Transmitting

Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
2447.0	0.7765	892.0381
2457.0	0.8366	895.4161



Averaging factor (Duty factor) Calculation chart



* Worst Transmit Duty cycle is Communication mode with Cyclocomputer which max on time is 0.144 ms and Minimum interval is 83 ms (Refer to ANT+ Worst Transmit Duty sheet).
The ON time (0.144 ms) appears 2.0 times (100 / 83) in 100 ms.
The actual measurement value was applied as Averaging factor (Duty factor).
(This specification is from customer)

Radiated Emission

Report No.	12403128S-B		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	August 18, 2018	August 17, 2018	August 16, 2018
Temperature / Humidity	22 deg. C / 51 % RH	24 deg. C / 58 % RH	24 deg. C / 63 % RH
Engineer	Kazuya Noda	Kazutaka Takeyama	Shiro Kobayashi
	(9 kHz - 30 MHz)	(30 MHz - 1 GHz)	(1 GHz - 26.5 GHz)
Mode	Tx ANT+ 2447 MHz		

(* PK: Peak, 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.	135.785	QP	22.40	14.31	7.51	32.13	0.00	12.09	43.50	31.4	150	234	
Hori.	866.390	QP	21.40	21.96	10.98	31.29	0.00	23.05	46.00	22.9	100	81	
Hori.	2390.000	PK	48.87	27.86	14.13	44.13	2.47	49.20	73.90	24.7	101	53	
Hori.	2400.000	PK	48.89	27.86	14.14	44.14	2.47	49.22	73.90	24.6	101	53	
Hori.	2447.000	PK	91.46	27.80	14.18	44.15	2.47	91.76	113.90	22.1	101	53	Carrier
Hori.	2483.500	PK	48.67	27.65	14.22	44.16	2.47	48.85	73.90	25.0	101	53	
Hori.	4894.000	PK	55.01	31.32	6.46	44.48	2.47	50.78	73.90	23.1	100	315	
Hori.	7341.000	PK	47.74	37.04	8.34	44.04	2.47	51.55	73.90	22.3	150	0	
Hori.	9788.000	PK	47.15	38.92	9.18	43.85	2.47	53.87	73.90	20.0	150	0	
Vert.	32.422	QP	22.50	17.74	6.50	32.20	0.00	14.54	40.00	25.4	100	0	
Vert.	37.544	QP	23.00	15.78	6.60	32.20	0.00	13.18	40.00	26.8	100	287	
Vert.	181.060	QP	22.30	16.03	7.84	32.09	0.00	14.08	43.50	29.4	100	1	
Vert.	240.006	QP	25.50	11.65	8.31	32.03	0.00	13.43	46.00	32.5	100	224	
Vert.	626.987	QP	21.10	19.73	10.10	31.96	0.00	18.97	46.00	27.0	100	1	
Vert.	2390.000	PK	49.12	27.86	14.13	44.13	2.47	49.45	73.90	24.4	205	359	
Vert.	2400.000	PK	48.95	27.86	14.14	44.14	2.47	49.28	73.90	24.6	205	359	
Vert.	2447.000	PK	87.58	27.80	14.18	44.15	2.47	87.88	113.90	26.0	205	359	Carrier
Vert.	2483.500	PK	48.86	27.65	14.22	44.16	2.47	49.04	73.90	24.8	205	359	
Vert.	4894.000	PK	53.91	31.32	6.46	44.48	2.47	49.68	73.90	24.2	100	2	
Vert.	7341.000	PK	48.11	37.04	8.34	44.04	2.47	51.92	73.90	21.9	150	0	
Vert.	9788.000	PK	47.67	38.92	9.18	43.85	2.47	54.39	73.90	19.5	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(3.98 m / 3.0 m) = 2.47 dB

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

Peak measurement value with Averaging factor (Duty factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Averaging Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	48.87	27.86	14.13	44.13	-50.81	2.47	-1.61	53.90	55.5	*1)
Hori.	2400.000	PK	48.89	27.86	14.14	44.14	-50.81	2.47	-1.59	53.90	55.5	
Hori.	2447.000	PK	91.46	27.80	14.18	44.15	-50.81	2.47	40.95	93.90	53.0	Carrier
Hori.	2483.500	PK	48.67	27.65	14.22	44.16	-50.81	2.47	-1.96	53.90	55.9	*1)
Hori.	4894.000	PK	55.01	31.32	6.46	44.48	-50.81	2.47	-0.03	53.90	53.9	
Hori.	7341.000	PK	47.74	37.04	8.34	44.04	-50.81	2.47	0.74	53.90	53.2	
Hori.	9788.000	PK	47.15	38.92	9.18	43.85	-50.81	2.47	3.06	53.90	50.8	
Vert.	2390.000	PK	49.12	27.86	14.13	44.13	-50.81	2.47	-1.36	53.90	55.3	*1)
Vert.	2400.000	PK	48.95	27.86	14.14	44.14	-50.81	2.47	-1.53	53.90	55.4	
Vert.	2447.000	PK	87.58	27.80	14.18	44.15	-50.81	2.47	37.07	93.90	56.8	Carrier
Vert.	2483.500	PK	48.86	27.65	14.22	44.16	-50.81	2.47	-1.77	53.90	55.7	*1)
Vert.	4894.000	PK	53.91	31.32	6.46	44.48	-50.81	2.47	-1.13	53.90	55.0	
Vert.	7341.000	PK	48.11	37.04	8.34	44.04	-50.81	2.47	1.11	53.90	52.8	
Vert.	9788.000	PK	47.67	38.92	9.18	43.85	-50.81	2.47	3.58	53.90	50.3	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.98 m / 3.0 m) = 2.47 dB

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

Averaging factor refer to "Averaging factor (Duty factor) Calculation chart" sheet.

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

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 Emission

Report No.	12403128S-B		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	August 18, 2018	August 17, 2018	August 16, 2018
Temperature / Humidity	22 deg. C / 51 % RH	24 deg. C / 58 % RH	24 deg. C / 63 % RH
Engineer	Kazuya Noda	Kazutaka Takeyama	Shiro Kobayashi
	(9 kHz - 30 MHz)	(30 MHz - 1 GHz)	(1 GHz - 26.5 GHz)
Mode	Tx ANT+ 2457 MHz		

(* PK: Peak, 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.	135.548	QP	22.60	14.28	7.51	32.13	0.00	12.26	43.50	31.2	150	234	
Hori.	853.815	QP	21.50	21.69	10.95	31.36	0.00	22.78	46.00	23.2	150	329	
Hori.	2390.000	PK	48.09	27.86	14.13	44.13	2.47	48.42	73.90	25.4	138	53	
Hori.	2400.000	PK	47.77	27.86	14.14	44.14	2.47	48.10	73.90	25.8	138	53	
Hori.	2457.000	PK	90.36	27.77	14.20	44.15	2.47	90.65	113.90	23.2	138	53	Carrier
Hori.	2483.500	PK	48.22	27.65	14.22	44.16	2.47	48.40	73.90	25.5	138	53	
Hori.	4914.000	PK	53.42	31.34	6.46	44.49	2.47	49.20	73.90	24.7	101	313	
Hori.	7371.000	PK	47.79	37.02	8.37	44.05	2.47	51.60	73.90	22.3	150	0	
Hori.	9828.000	PK	47.73	39.04	9.20	43.86	2.47	54.58	73.90	19.3	150	0	
Vert.	31.697	QP	22.70	18.04	6.48	32.20	0.00	15.02	40.00	24.9	100	61	
Vert.	37.292	QP	23.10	15.88	6.59	32.20	0.00	13.37	40.00	26.6	100	21	
Vert.	180.798	QP	22.20	16.02	7.84	32.09	0.00	13.97	43.50	29.5	100	320	
Vert.	240.006	QP	25.30	11.65	8.31	32.03	0.00	13.23	46.00	32.7	100	88	
Vert.	626.385	QP	21.00	19.73	10.10	31.96	0.00	18.87	46.00	27.1	100	110	
Vert.	2390.000	PK	48.18	27.86	14.13	44.13	2.47	48.51	73.90	25.3	240	0	
Vert.	2400.000	PK	48.12	27.86	14.14	44.14	2.47	48.45	73.90	25.4	240	0	
Vert.	2457.000	PK	87.43	27.77	14.20	44.15	2.47	87.72	113.90	26.1	240	0	Carrier
Vert.	2483.500	PK	48.88	27.65	14.22	44.16	2.47	49.06	73.90	24.8	240	0	
Vert.	4914.000	PK	53.96	31.34	6.46	44.49	2.47	49.74	73.90	24.1	116	349	
Vert.	7371.000	PK	47.45	37.02	8.37	44.05	2.47	51.26	73.90	22.6	150	0	
Vert.	9828.000	PK	47.88	39.04	9.20	43.86	2.47	54.73	73.90	19.1	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(3.98 m / 3.0 m) = 2.47 dB

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

Peak measurement value with Averaging factor (Duty factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Averaging Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	48.09	27.86	14.13	44.13	-50.81	2.47	-2.39	53.90	56.3	*1)
Hori.	2400.000	PK	47.77	27.86	14.14	44.14	-50.81	2.47	-2.71	53.90	56.6	
Hori.	2457.000	PK	90.36	27.77	14.20	44.15	-50.81	2.47	39.84	93.90	54.1	Carrier
Hori.	2483.500	PK	48.22	27.65	14.22	44.16	-50.81	2.47	-2.41	53.90	56.3	*1)
Hori.	4914.000	PK	53.42	31.34	6.46	44.49	-50.81	2.47	-1.61	53.90	55.5	
Hori.	7371.000	PK	47.79	37.02	8.37	44.05	-50.81	2.47	0.79	53.90	53.1	
Hori.	9828.000	PK	47.73	39.04	9.20	43.86	-50.81	2.47	3.77	53.90	50.1	
Vert.	2390.000	PK	48.18	27.86	14.13	44.13	-50.81	2.47	-2.30	53.90	56.2	*1)
Vert.	2400.000	PK	48.12	27.86	14.14	44.14	-50.81	2.47	-2.36	53.90	56.3	
Vert.	2457.000	PK	87.43	27.77	14.20	44.15	-50.81	2.47	36.91	93.90	57.0	Carrier
Vert.	2483.500	PK	48.88	27.65	14.22	44.16	-50.81	2.47	-1.75	53.90	55.7	*1)
Vert.	4914.000	PK	53.96	31.34	6.46	44.49	-50.81	2.47	-1.07	53.90	55.0	
Vert.	7371.000	PK	47.45	37.02	8.37	44.05	-50.81	2.47	0.45	53.90	53.5	
Vert.	9828.000	PK	47.88	39.04	9.20	43.86	-50.81	2.47	3.92	53.90	50.0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.98 m / 3.0 m) = 2.47 dB

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

Averaging factor refer to "Averaging factor (Duty factor) Calculation chart" sheet.

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

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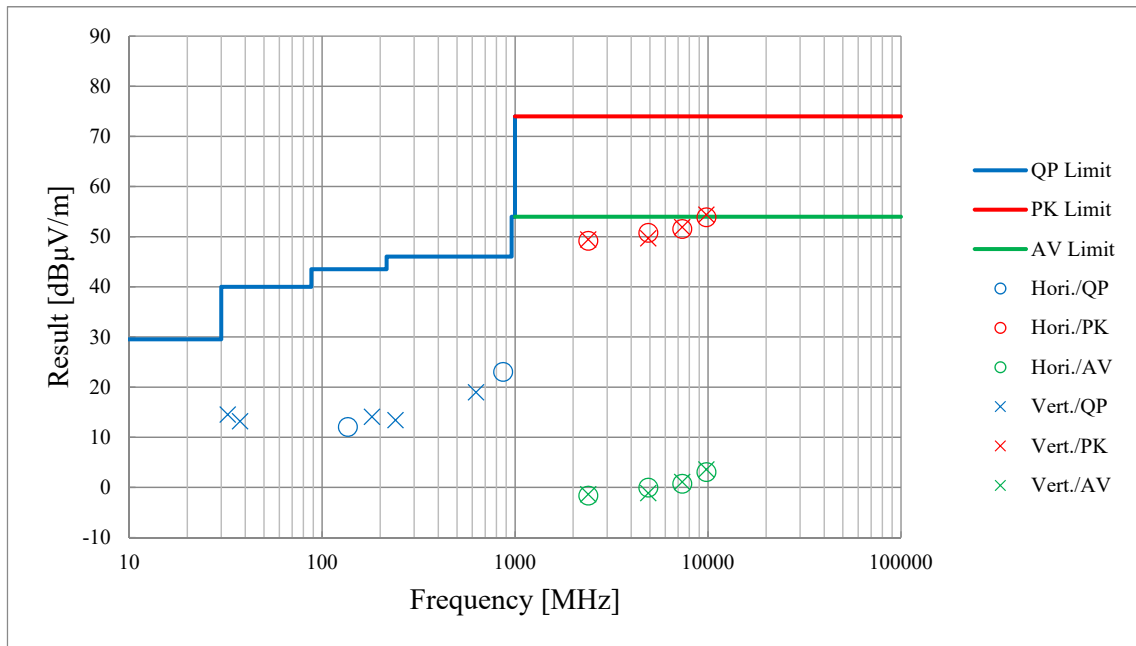
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission
(Plot data, Worst case)

Report No.	12403128S-B		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	August 18, 2018	August 17, 2018	August 16, 2018
Temperature / Humidity	22 deg. C / 51 % RH	24 deg. C / 58 % RH	24 deg. C / 63 % RH
Engineer	Kazuya Noda (9 kHz - 30 MHz)	Kazutaka Takeyama (30 MHz - 1 GHz)	Shiro Kobayashi (1 GHz - 26.5 GHz)
Mode	Tx ANT+ 2457 MHz		



*These plots data contains sufficient number to show the trend of characteristic features for EUT.
*The plots data in the frequency range below 10MHz is omitted. since the noise was not detected in the range.

APPENDIX 2: Test instruments

Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2018/03/05 * 12
SCC-G32	Coaxial Cable	Junkosha	MWX241-02000KM SKMS	OCT-09-13-005	AT	2017/11/22 * 12
SAT10-15	Attenuator	Weinschel Corp.	54A-10	83406	AT	2017/12/08 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2017/12/21 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2017/10/11 * 12
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2018/06/02 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2018/06/01 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	RE	2018/01/29 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2018/05/11 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2018/07/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI, MF)	-	RE	-
STS-03	Digital Hister	Hioki	3805-50	080997823	RE	2017/10/16 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2018/06/02 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2018/06/17 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2018/06/17 * 12
SAT6-13	Attenuator	JFW	50HF-006N	-	RE	2018/02/09 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2018/04/09 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2018/02/16 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2017/11/24 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2018/07/23 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2018/03/27 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KMSKMS	-	RE	2018/04/20 * 12
SCC-G45	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102E	800137/2EA	RE	2018/03/28 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2017/10/16 * 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
AT: Antenna Terminal Conducted test

UL Japan, Inc.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401