RADIO TEST REPORT

Test Report No. : 10126453S-A

Applicant	:	**PIONEER CORPORATION**
Type of Equipment	:	**Pedaling Monitor Sensor**
Model No.	:	**SGY-PM910H**
FCC ID	:	**AJDK077**
Test regulation	:	**FCC Part15 Subpart C: 2013**
Test result	:	**Complied**

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.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: December 24 to 25, 2013

Representative test engineer:

Tatsuya Arai
Engineer of WiSE Japan,
UL Verification Service

Approved by :

Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service

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

Testing
RTL02610

UL Japan, Inc.
Shonan EMC Lab.
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REVISION HISTORY

Original Test Report No.: 10126453S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10126453S-A	January 24, 2014	-	-
1	10126453S-A	January 28, 2014	P4	Correction of Product description
2	10126453S-A	January 30, 2014	P7 P12-13 P15	Correction of Configuration and peripherals Correction of Duty factor Correction of test equipment list

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Contents

SECTION 1: Customer information

Company Name	:	PIONEER CORPORATION
Brand name	:	Pioneer
Address	:	25-1 Aza-Nishi-machi, Yamada, Kawagoe-shi, Saitama, 350-8555, JAPAN
Telephone Number	:	+81-49-228-6415
Facsimile Number	:	+81-49-228-6493
Contact Person	:	Yoshihisa Kobayashi

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

2.1 Identification of E.U.T.

Type of Equipment	:	Pedaling Monitor Sensor
Model No.	:	SGY-PM910H
Serial No.	:	Refer to 4.2 of this report.
Rating	:	DC3.0V
Receipt Date of Sample	:	December 24, 2013
Country of Mass-production	:	Japan
Condition of EUT	:	Production 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: SGY-PM910H (referred to as the EUT in this report) is a Pedaling Monitor Sensor.

Clock frequency(ies) in the system : 32.768kHz, 16MHz

Radio specification

Equipment type	:	Transceiver
Frequency of operation	:	2457MHz
Type of modulation	:	GFSK
Antenna type	:	Chip
Antenna connector type	:	None
Operation temperature range	:	-10 to +50 deg.C.
ITU code	:	F1D

FCC 15.31 (e)
This EUT provides stable voltage (DC1.8V) constantly to RF transmitter regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC 15.203
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.

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification	:	FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.209 Radiated emission limits, general requirements Section 15.249 Operation within the bands 902-928MHz, 2400-2483.5MHz, 5725-5875MHz, and 24.0-24.25GHz

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	N/A	N/A
20dB bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.215	Conducted	N/A	-	Complied
Electric field strength of fundamental emission	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.249 (a)(e), 15.209	Radiated	N/A	24.1dB Detector: Peak Polarization: Horizontal	Complied
Electric field strength of spurious emission	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.205 (a)(b), 15.209, 15.249 (a)(d)(e)	Radiated	N/A	7.0dB (for Average Limit) *3) Freq.: 2390.000 MHz, 2483.5MHz Detector: Peak Polarization: Vertical	Complied
Frequency tolerance	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.249 (b)	-	N/A *2)	N/A	N/A

Note: UL Japan's EMI Work Procedures No.13-EM-W0420 and 13-EM-W0422
*1) The test is not applicable since the EUT has no AC mains. (The EUT does not perform the radio function during recharging.)
*2) The test is not required since this EUT does not operate in the restricted bands and the prohibited TV bands.
*3) The limit for Average detector is applied to the measurement value with Peak detector.

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1	-	Conducted	-	Complied

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.

Item	Frequency range	No.1 SAC[*1]/SR[*2] (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.8 dB	5.0 dB	4.8 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-18GHz	4.9 dB	4.9 dB	4.9 dB
	18GHz-26.5GHz	5.1 dB	4.3 dB	4.3 dB

*1: SAC=Semi-Anechoic Chamber
*2: SR= Shielded Room is applied besides radiated emission

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

Antenna port conducted test
Bandwidth measurement uncertainty for this test was: (±) 5.4%

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.
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Telephone number : +81 463 50 6400
Facsimile number : +81 463 50 6401
JAB Accreditation No. : RTL02610

	FCC Registration No.	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	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Full-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	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

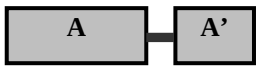
The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
All items	Transmitting	2457MHz

Firmware: 2013.11.29

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

4.2 Configuration and peripherals



* 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 (Transmitter)	SGY-PM910H	17*1) 18*2)	Pioneer	EUT
A'	Pedaling Monitor Sensor (Junction box)	SGY-PM910H	17*1) 18*2)	Pioneer	EUT

*1) For bandwidth test
*2) For radiated emission test
*A Dip SW for transmit-receive switching was added to EUT during the test, but it does not affect the test results.

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

EUT was placed on a urethane platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

5.3 Test conditions

Frequency range : 9kHz to 26GHz
EUT position : Table top

5.4 Test procedure

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

<9kHz to 30MHz>
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: 0deg.to 360deg.) and horizontal polarization.

* FCC 15.31 (f)(2) (9kHz-30MHz)
9kHz – 490kHz [Limit at 3m]= [Limit at 300m]-40log (3[m]/300[m])
490kHz – 30MHz [Limit at 3m]= [Limit at 30m]-40log (3[m]/30[m])

<30MHz to 26GHz>
The measuring antenna height was varied between 1 and 4m 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 detection of the test receiver and spectrum analyzer.

	9kHz to 90kHz & 110kHz to 150kHz	90kHz to 110kHz	150kHz to 490kHz	490kHz to 30MHz	30MHz to 1GHz	1GHz to 26GHz	
Detector type	PK/AV	QP	PK/AV	QP	QP	PK	AV *1)
IF Bandwidth	200Hz	200Hz	10kHz	9kHz	120kHz	RBW: 1MHz /VBW: 3MHz	-

*1) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector (or used duty factor).

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.

Worst position:

Frequency / Antenna polarization	Carrier	Spurious		
		9kHz-30MHz	30-1000MHz	1-26GHz
Horizontal	X	X	X	X
Vertical	Y	X	X	Z

Figure 1. Direction of the Loop Antenna

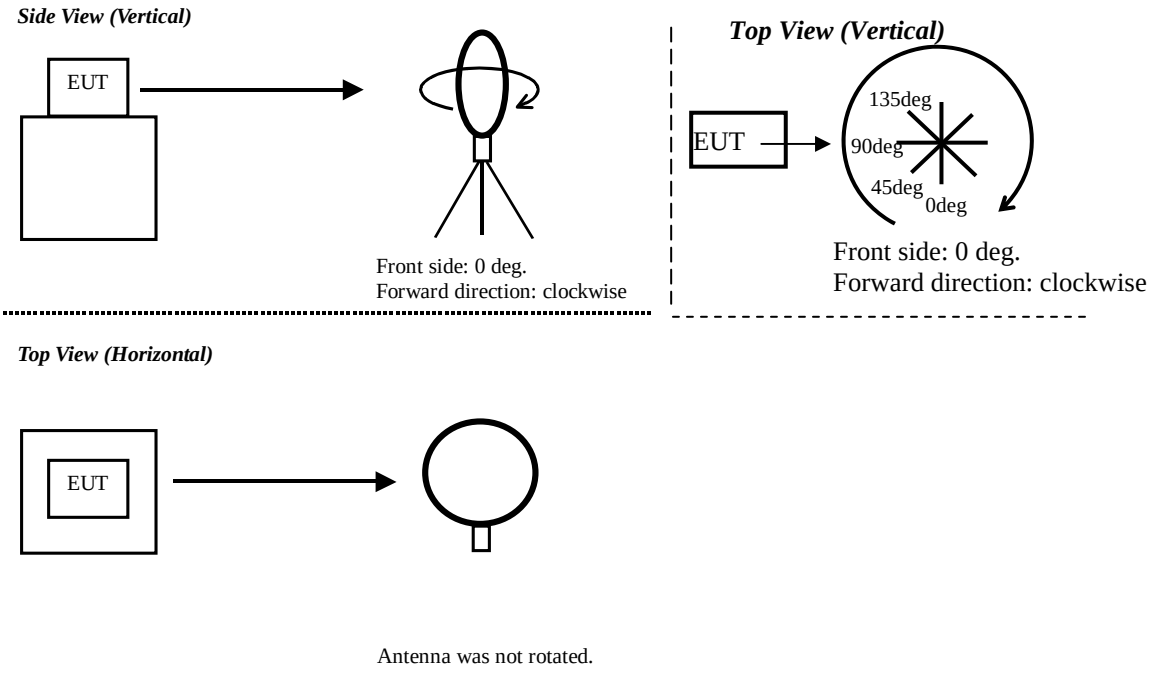
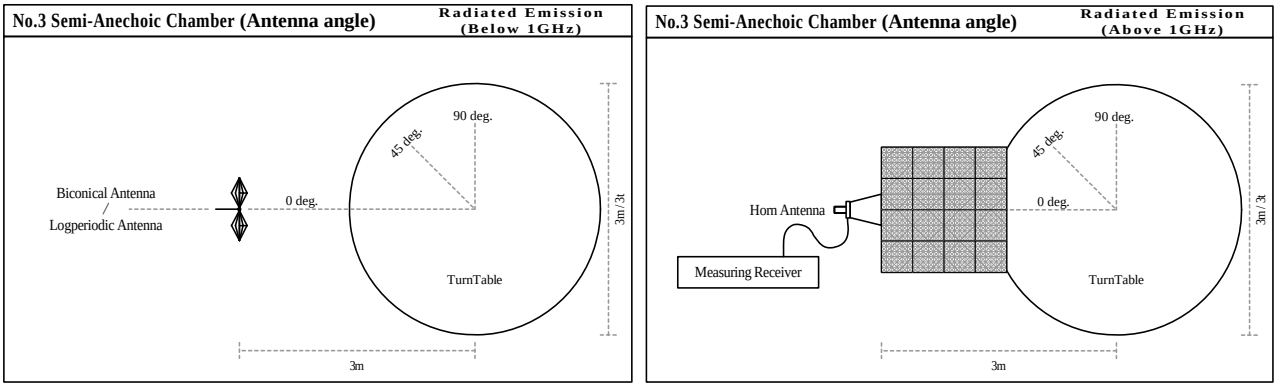


Figure 2. Antenna angle (except Loop antenna)



5.5 Results

Summary of the test results : Pass
* No noise was detected in the 6th to 10th harmonics and below 30MHz.

Refer to APPENDIX 1

SECTION 6: 20dB bandwidth & Occupied bandwidth (99%)

6.1 Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Refer to APPENDIX 1

Contents of APPENDIXES

APPENDIX 1: Test data

20dB bandwidth
Radiated emission
Duty factor calculation chart
99% Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission
Pre-check of the worst position

APPENDIX 1: Test data

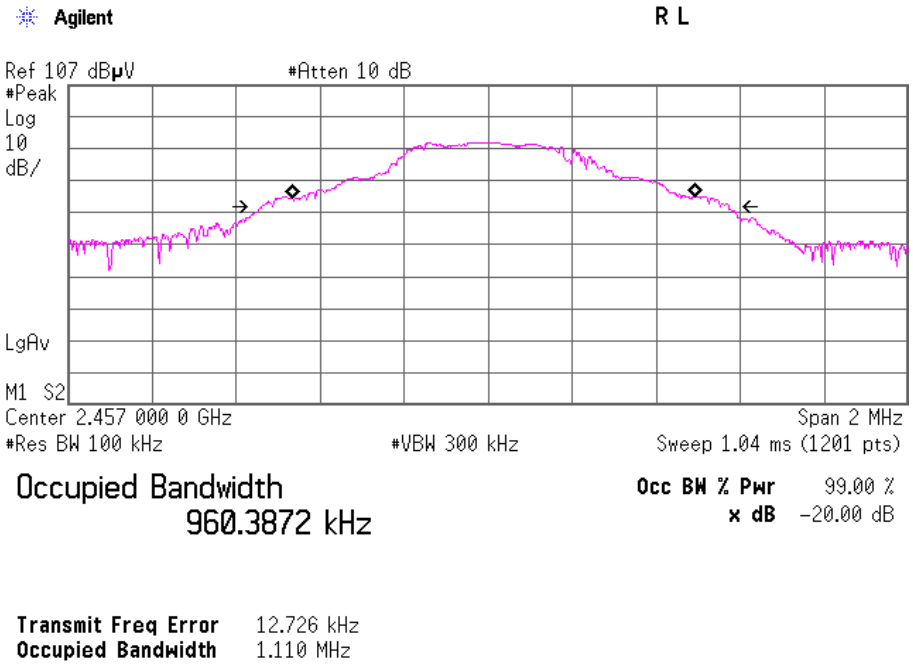
20dB Bandwidth

UL Japan, Inc.
Shonan EMC Lab. No.3 Shielded Room

Company	: PIONEER CORPORATION	Regulation	: FCC Part15C Section 15.215
Equipment	: Pedaling Monitor Sensor	Test Distance	: -
Model	: SGY-PM910H	Date	: December 25, 2013
Sample No.	: 17	Temperature	: 22deg.C
Power	: DC3V	Humidity	: 31%RH
Mode	: Transmitting	Engineer	: Tatsuya Arai

	20dB Bandwidth [MHz]
2457MHz	1.110

Transmitting 2457MHz



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Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date December 24, 2013 December 25, 2013
Temperature / Humidity 22 deg.C, 31 %RH 25 deg.C, 31 %RH
Engineer Tatsuya Arai
Mode Tx, 2457 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	160.000	QP	21.1	14.8	7.8	32.1	11.6	43.5	31.9	100	0	
Hori.	320.000	QP	21.1	14.3	8.6	31.9	12.1	46.0	33.9	100	0	
Hori.	2390.000	PK	43.5	26.8	14.7	38.2	46.8	53.9	7.1	100	209	*1
Hori.	2400.000	PK	43.1	26.8	14.7	38.2	46.4	53.9	7.5	100	209	*1
Hori.	2457.000	PK	86.4	26.8	14.8	38.2	89.8	113.9	24.1	100	35	
Hori.	2483.500	PK	42.6	26.9	14.8	38.1	46.2	53.9	7.7	100	209	*1
Hori.	4914.000	PK	58.6	31.6	7.4	37.0	60.6	73.9	13.3	100	343	
Hori.	7371.000	PK	46.1	37.3	8.8	39.4	52.8	73.9	21.1	100	0	
Hori.	9828.000	PK	43.4	38.8	10.0	37.5	54.7	73.9	19.2	100	0	
Hori.	12285.000	PK	45.2	39.6	10.9	38.3	57.4	73.9	16.5	100	0	
Vert.	160.000	QP	21.4	14.8	7.8	32.1	11.9	43.5	31.6	100	0	
Vert.	320.000	QP	21.0	14.3	8.6	31.9	12.0	46.0	34.0	100	0	
Vert.	2390.000	PK	43.6	26.8	14.7	38.2	46.9	53.9	**7.0**	100	241	*1
Vert.	2400.000	PK	42.8	26.8	14.7	38.2	46.1	53.9	7.8	100	241	*1
Vert.	2457.000	PK	85.9	26.8	14.8	38.2	89.3	113.9	24.6	100	242	
Vert.	2483.500	PK	43.3	26.9	14.8	38.1	46.9	53.9	**7.0**	100	241	*1
Vert.	4914.000	PK	56.2	31.6	7.4	37.0	58.2	73.9	15.7	100	264	
Vert.	7371.000	PK	46.9	37.3	8.8	39.4	53.6	73.9	20.3	100	0	
Vert.	9828.000	PK	43.9	38.8	10.0	37.5	55.2	73.9	18.7	100	0	
Vert.	12285.000	PK	45.3	39.6	10.9	38.3	57.5	73.9	16.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) The limit for Average detector is applied. (out of band emission)

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2457.000	PK	86.4	26.8	14.8	38.2	-56.8	33.0	93.9	60.9	
Hori.	4914.000	PK	58.6	31.6	7.4	37.0	-56.8	3.8	53.9	**50.1**	
Hori.	7371.000	PK	46.1	37.3	8.8	39.4	-56.8	-4.0	53.9	57.9	
Hori.	9828.000	PK	43.4	38.8	10.0	37.5	-56.8	-2.1	53.9	56.0	
Hori.	12285.000	PK	45.2	39.6	10.9	38.3	-56.8	0.6	53.9	53.3	
Vert.	2457.000	PK	85.9	26.8	14.8	38.2	-56.8	32.5	93.9	61.4	
Vert.	4914.000	PK	56.2	31.6	7.4	37.0	-56.8	1.4	53.9	52.5	
Vert.	7371.000	PK	46.9	37.3	8.8	39.4	-56.8	-3.2	53.9	57.1	
Vert.	9828.000	PK	43.9	38.8	10.0	37.5	-56.8	-1.6	53.9	55.5	
Vert.	12285.000	PK	45.3	39.6	10.9	38.3	-56.8	0.7	53.9	53.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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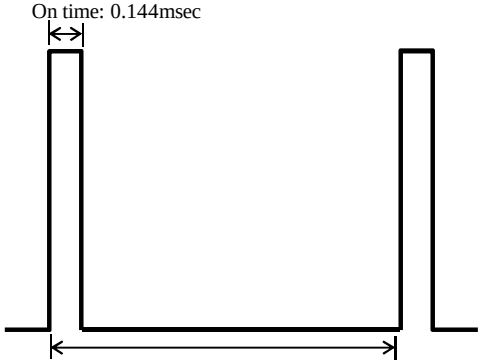
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	December 24, 2013	
Temperature / Humidity	22 deg.C, 31 %RH	
Engineer	Tatsuya Arai	

Duty Factor Calculation chart

Tx 2457MHz

Duty Factor Calculation	
Duty Factor: 20log (1/duty cycle) = 56.8dB	
duty cycle = 0.144 / 100 = 0.00144 (0.144%)	
1x2_duty1 On time: 0.144msec  One period ・Pedaling mode: 167msec ・Power meter mode: 250msec * This sample operates in one of two modes above. Therefore, worst case of ON time during 100ms is a single.	1x2_duty2

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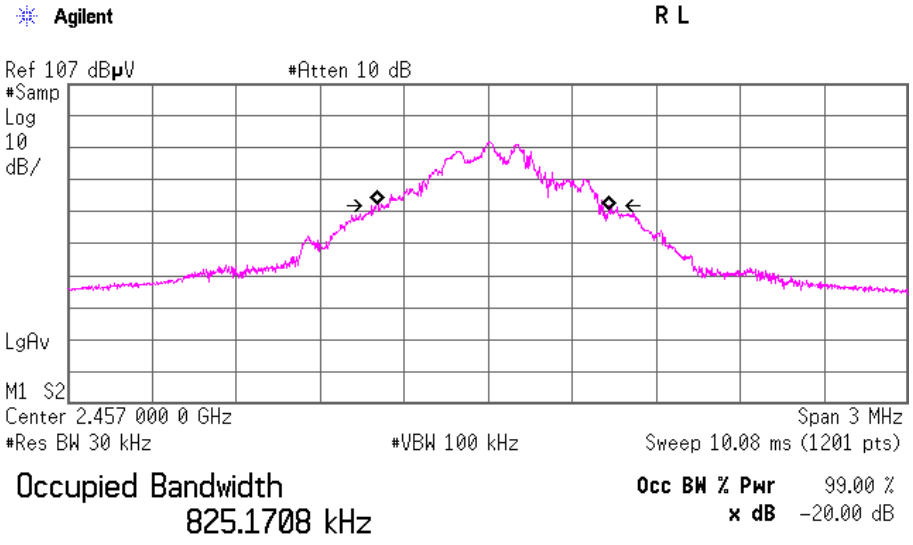
99% Occuiped Bandwidth

UL Japan, Inc.
Shonan EMC Lab. No.3 Shielded Room

Company	: PIONEER CORPORATION	Regulation	: RSS-Gen
Equipment	: Pedaling Monitor Sensor	Test Distance	: -
Model	: SGY-PM910H	Date	: December 25, 2013
Sample No.	: 17	Temperature	: 22deg.C
Power	: DC3V	Humidity	: 31%RH
Mode	: Transmitting	Engineer	: Tatsuya Arai

	99% Occupied Bandwidth [kHz]
2457MHz	825.171

Transmitting 2457MHz



Transmit Freq Error	18.028 kHz
Occupied Bandwidth	839.687 kHz*

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APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2013/11/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE/AT	2013/03/04 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2013/11/22 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2013/04/09 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2013/03/16 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	AT	2013/03/07 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2013/10/26 * 12
SCC-C1/C2/C 3/C4/C5/C10/ SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2013/10/26 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2013/11/08 * 12
SAT6-07	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2013/03/14 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2013/03/19 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2013/03/16 * 12

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: Out of Band Emission (Radiated)
AT: Antenna terminal conducted test