

# ***RFI MEASUREMENT TEST REPORT***

## ***FCC PART 15 SUBPART B CLASS B***

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### **ALL OTHER DEVICES**

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**EQUIPMENT** : **Heart Rate Activity Monitor**

**TRADE NAME** : **EPSON**

**MODEL NUMBER** : **PS-500**

**TEST REPORT No.** : **E-103-130648**



**JAB**

Testing

RTL02110

The test result of this report is effective for the equipment under test itself and test configuration described on the report.

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## TEST CERTIFICATION

### Manufacturer Information

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Test started : January 26, 2014  
Test completed : January 28, 2014  
Purpose of test : Compliance with standards  
Test specification(s) : FCC Part 15 Subpart B Class B (Unintentional Radiators)  
Test procedure(s) : ANSI C63.4 (2003)  
(The limit value complies with CISPR 22 Class B (1997).)

Tested by



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Report checked by



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Report approved by

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Report issue date

: January 31, 2014

## **TEST REPORT CONTENT**

<b>1. CONCLUSIONS AND TEST PROCEDURES .....</b>	<b>4</b>
1.1 Emission tests	
1.2 Measurement uncertainties	
1.3 Deviations from, additions to or exclusions from the standard	
<b>2. MEASUREMENT PROCEDURES .....</b>	<b>5</b>
2.1 Conducted disturbance emission	
2.2 Radiated disturbance emission	
<b>3. DETAILED DESCRIPTION OF TEST ITEM.....</b>	<b>7</b>
3.1 Equipment under test (EUT)	
3.2 Auxiliary equipment (AE)	
3.3 Relevant signal and power lines	
3.4 Connection of cables	
<b>4. OPERATING CONDITIONS.....</b>	<b>10</b>
4.1 Operation mode(s)	
<b>5. EVALUATION OF TEST RESULTS .....</b>	<b>11</b>
5.1 Conducted disturbance emission	
5.2 Photographs of conducted disturbance emission	
5.3 Radiated disturbance emission	
5.4 Photographs of radiated disturbance emission	
<b>6. LIST OF UTILIZED TEST EQUIPMENT .....</b>	<b>17</b>

## 1. CONCLUSIONS AND TEST PROCEDURES

This test report shows that the EUT complies with the FCC Part 15 Subpart B Class B specification.

These tests were carried out with test procedures drawn by our laboratory based on the following standards.

The detailed description of the test results can be found in § 5.

### 1.1 Emission tests

Test item	Test procedure	Level	Limit value
Conducted disturbance emission (150 kHz - 30 MHz)	ANSI C63.4 (2003)	38.2 dB $\mu$ V (QP) (0.1500 MHz, Mode 2)	66.0 dB $\mu$ V
Radiated disturbance emission (30 MHz - 1 GHz)	ANSI C63.4 (2003)	31.3 dB $\mu$ V/m (QP) (960.042 MHz, Mode 1)	37.0 dB $\mu$ V/m

Note 1: This data represents the highest emission level of this test.

Note 2: Conducted disturbance emission is applied to the AC port of the AC adapter (AE8) because DC power is supplied to the EUT via the AC adapter (AE8) and the Cradle (AE7).

### 1.2 Measurement uncertainties

Measurement uncertainties are shown as below.

Conducted disturbance emission	$\pm 1.34$ dB	(EMI shielded room II)
Radiated disturbance emission (d = 10m)	$\pm 3.47$ dB	(10 m semi-anechoic chamber I)

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of  $k = 2$ , providing a level of confidence of approximately 95 %.

### 1.3 Deviations from, additions to or exclusions from the standard

There are no deviations from, additions to or exclusions from the standard.

## 2. MEASUREMENT PROCEDURES

### 2.1 Conducted disturbance emission

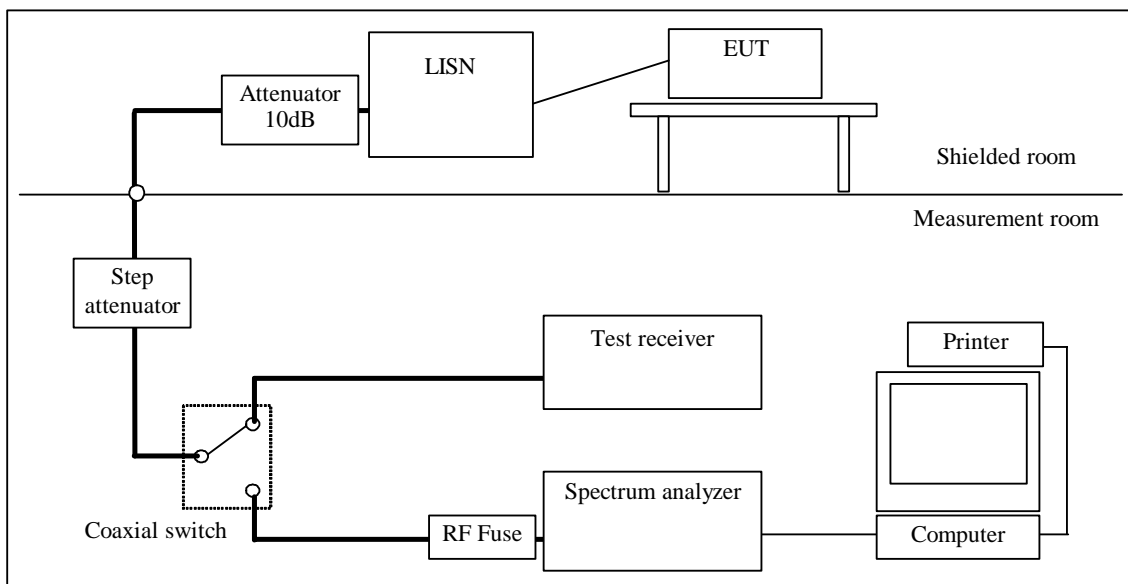
This measurement is performed to all N (Neutral) and L (Live)-phase AC cable lines.

As the preliminary measurement, confirm the noise spectrum from 150 kHz to 30 MHz by the spectrum analyzer.

Select at least 6 low margin points against the QP Limit, based on the measurement data obtained in 2.

As the final measurement, measure the maximum noise level of the selected points in detail by the receiver. (At this time confirming the effect of the placement of the interface cables, measure the maximum points of the noise level.)

In the receiver measurement, measure the maximum noise level using the QP detector (IF bandwidth: 9 kHz or 10 kHz) and the Average detector (IF bandwidth: 9 kHz or 10 kHz).



## 2.2 Radiated disturbance emission

### 2.2.1 Below 1 GHz

As the preliminary measurement, confirm the noise spectrum below 1 GHz by the spectrum analyzer.  
(At this time fixing the antenna height, scan all directions ( $360^\circ$ ) of the EUT and confirm the maximum noise level. Perform this operation against horizontal and vertical polarized waves.)

Select at least 6 low margin points against the QP Limit, based on the measurement data obtained in 1.

As the final measurement, measure the maximum noise level of the selected points in detail, using the QP detector (IF bandwidth: 120 kHz) of the receiver.

(At this time scanning the antenna height between 1 m and 4 m and all directions ( $360^\circ$ ) of the EUT and changing the placement of the interface cables, search and measure the maximum points of the noise level.)

### 2.2.2 Above 1 GHz

As the preliminary measurement, confirm the noise spectrum above 1 GHz by the spectrum analyzer.

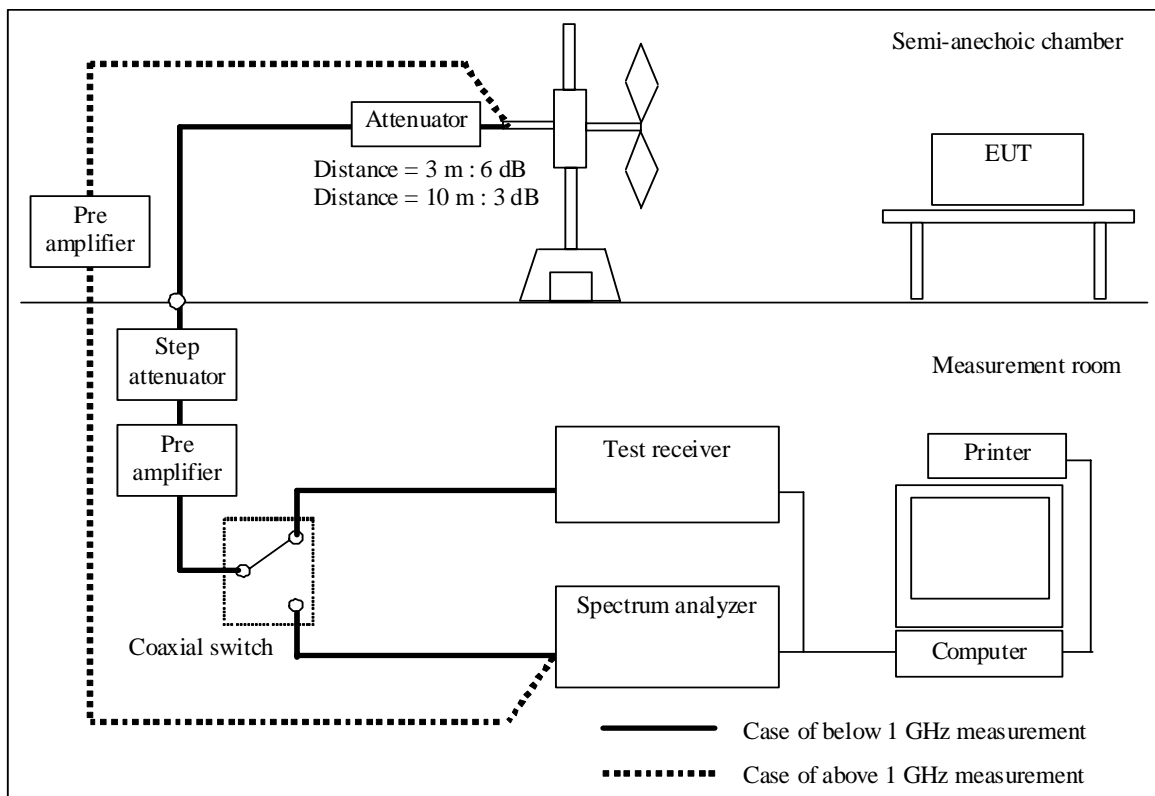
(At this time fixing the antenna height, scan all directions ( $360^\circ$ ) of the EUT and confirm the maximum noise level. Perform this operation against horizontal and vertical polarized waves.)

Select low margin points against the Average Limit, based on the measurement data obtained in 1.

As the final measurement, measure the maximum noise level of the selected points in detail, using the Peak detector (IF bandwidth: 1 MHz) and the Average detector (IF bandwidth: 1 MHz) of the spectrum analyzer.

(At this time scanning the antenna height from 1 m to the EUT height and all directions ( $360^\circ$ ) of the EUT and changing the placement of the interface cables, search and measure the maximum points of the noise level.)

As the peak measurement in 3, judge the measurement values against the Peak Limit (Average Limit + 20 dB).



### 3. DETAILED DESCRIPTION OF TEST ITEM

#### 3.1 Equipment under test (EUT)

Kind of equipment	:	Heart Rate Activity Monitor
Test condition	:	Table-top
Manufacturer	:	SEIKO EPSON CORPORATION
Trade name	:	EPSON
Model number	:	PS-500
Serial number	:	ES50B00019
Rated voltage	:	DC 5.0 V
Rated current	:	0.1 A
Rated voltage (AC adapter)	:	AC 100 - 240 V ; 50 - 60 Hz
Rated current (AC adapter)	:	0.3 A
Port(s)	:	USB
Maximum used frequency	:	48 MHz
The condition of the EUT	:	Pre-production sample
Remarks	:	This laboratory has not made any modification to the EUT. DC power is supplied to the EUT via the AC adapter (3A-058WU05B (AE8)) and the Cradle (AE7).

### 3.2 Auxiliary equipment (AE)

AE	Name	Model (Serial number)	Manufacturer	FCC ID	Remark
1	Personal computer	HSTNC-059P-SF (JPA220HPJB)	Hewlett-Packard Company	DoC	Microsoft Windows 7
2	LCD monitor	L1710 (3CQ85219WZ)	Hewlett-Packard Company	DoC	-
3	Keyboard	KB-0133 (B692C0KGAP21FD)	Hewlett-Packard Company	DoC	-
4	Mouse	M-SBJ96 (F93AA0AN3UF00FR)	Hewlett-Packard Company	DoC	-
5	Printer	M129C (E2QG317981)	SEIKO EPSON Corporation	Verification	-
6	AC adapter	M159A (JWKZ63547G)	SEIKO EPSON Corporation	Verification	-
7	Cradle	E2060 (017)	SEIKO EPSON Corporation	N/A	-
8	AC adapter	3A-058WU05B (N/A)	ENG Electric Company	N/A	-

### 3.3 Relevant signal and power lines

Line	Name	Length	Shield	Remarks
1	Video I/F cable	1.8 m	Yes	Metal connector <sup>*1</sup> Ferrite core x 2
2	Keyboard I/F cable	1.8 m	Yes	Metal connector <sup>*1</sup>
3	Mouse I/F cable	1.8 m	Yes	Metal connector <sup>*1</sup>
4	Computer AC cable	1.8 m	No	- <sup>*1</sup>
5	Monitor AC cable	1.8 m	No	- <sup>*1</sup>
6	USB I/F cable	0.75 m	Yes	Metal connector
7	Extension code	2.5 m	No	- <sup>*2</sup>
8	Parallel I/F cable	2.1 m	Yes	Metal connector <sup>*1</sup>
9	AC adapter DC cable	1.5 m	Yes	Metal connector <sup>*1</sup> Ferrite core x 1
10	AC adapter AC cable	1.8 m	No	- <sup>*1</sup>

<sup>\*1</sup> Used for mode 1 only.

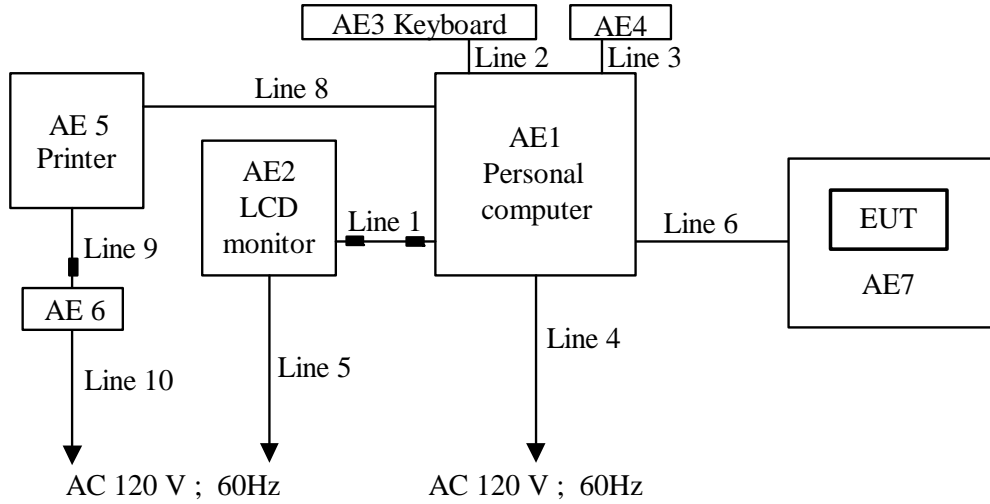
<sup>\*2</sup> Used for mode 2 only.



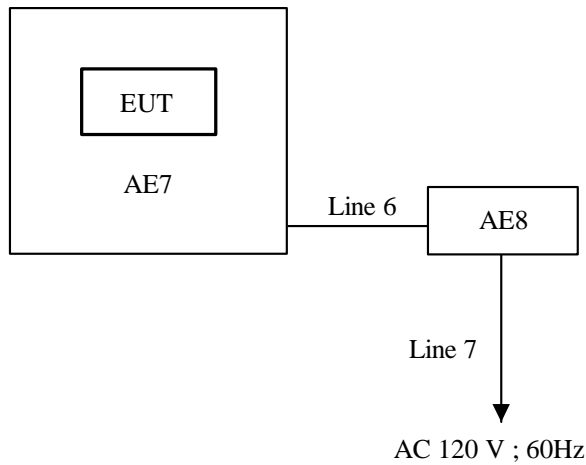
### 3.4 Connection of cables

■ : Ferrite core

(Mode 1)



(Mode 2)



Note: The equipment numbers and cable numbers in the above diagram, such as AE1 or Line 1, correspond to the equipment and cables in § 3.2 and 3.3.

For power-supply condition of the test facilities, the protective earthing and the neutral line are connected according to the normal terms of use.

## **4. OPERATING CONDITIONS**

The EUT was operated continuously during tests under following conditions.

### **4.1 Operation mode(s)**

#### **Mode 1: USB communication**

The test system repeats the following operations at the same time.

- 1: The Personal computer (AE1) reads and writes the data to the EUT via USB I/F (Line 6) and the Cradle (AE7).
- 2: The LCD monitor (AE2) displays the data.

#### **Mode 2: DC Power charge**

The test system repeats the following operations at the same time.

- 1: DC power is supplied to the Cradle (AE7) from the AC adapter (AE8) via USB I/F (Line 6).
- 2: The EUT is charged from the Cradle (AE7).
- 3: The EUT displays the sign of power charging.

Note: The transfer rate of USB I/F is 12 Mbps.



## 5.2 Photographs of conducted disturbance emission



**Front view**



**Rear view**

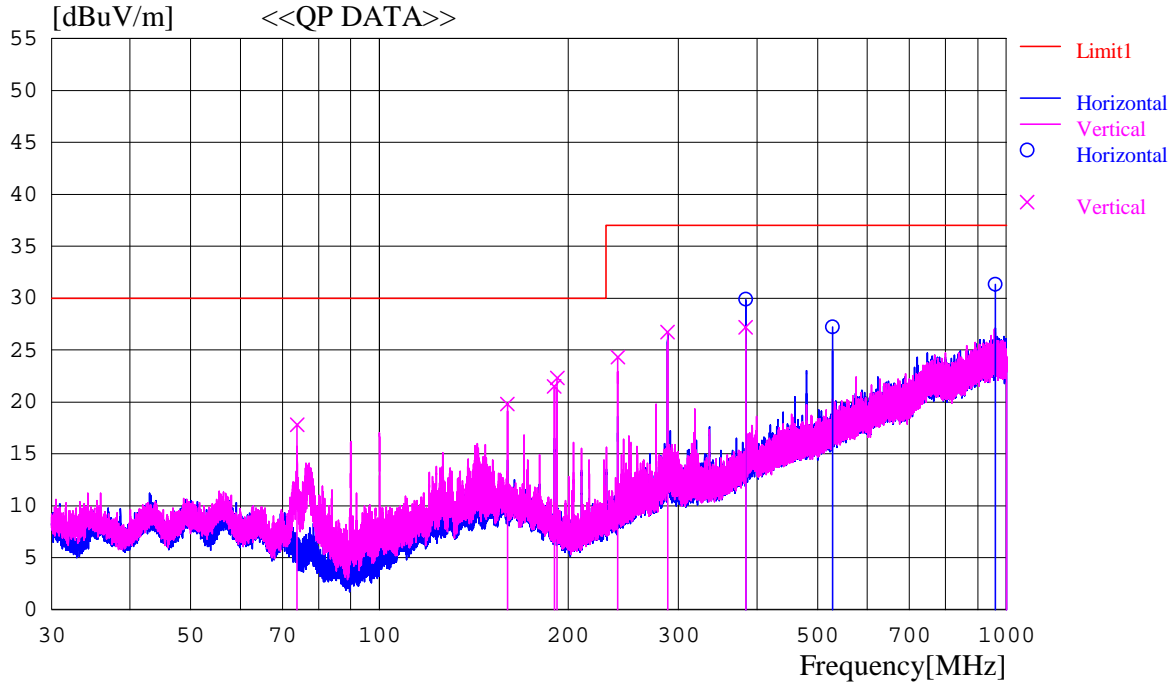
Test set-up complies with ANSI C63.4 (2003).

This configuration of the equipments and cables produces the highest conducted disturbance emissions.

### 5.3 Radiated disturbance emission

Operation mode	: Mode 1	Date	: Jan. 26 2014
Kind of equipment	: Heart Rate Activity Monitor	Temperature	: 24 °C
Model name	: PS-500	Humidity	: 36 %
Serial number	: ES50B00019	Location	: 10 m semi-anechoic chamber I
Comment	: Below 1 GHz	Distance	: 10 m
Detector	: QP	Engineer	: N. Hama

Limit1: [CISPR22] Class B (QP)



Frequency [MHz]	Meter Reading (QP) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (QP) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
73.887	27.4	BL	QP	10.0	-19.6	17.8	319	1.95	Vert	30.0	12.2
160.087	25.2	BL	QP	13.2	-18.6	19.8	101	1.00	Vert	30.0	10.2
190.100	29.0	BL	QP	10.7	-18.2	21.5	17	1.00	Vert	30.0	8.5
192.010	29.9	BL	QP	10.5	-18.1	22.3	184	1.00	Vert	30.0	7.7
240.002	30.4	BL	QP	11.6	-17.7	24.3	78	1.00	Vert	37.0	12.7
288.010	30.8	BL	QP	13.1	-17.2	26.7	61	1.00	Vert	37.0	10.3
384.022	28.2	BL	QP	15.0	-16.0	27.2	212	1.00	Vert	37.0	9.8
384.022	30.9	BL	QP	15.0	-16.0	29.9	234	2.29	Hori	37.0	7.1
528.008	24.4	BL	QP	18.3	-15.5	27.2	210	2.27	Hori	37.0	9.8
960.042	21.1	BL	QP	23.8	-13.6	31.3	48	3.36	Hori	37.0	5.7

Note: All other emissions in the frequency range from 30 MHz to 1 GHz are more than 10 dB below the limit.

Level = Meter Reading + Antenna Factor + Total Loss

Total Loss = Cable Loss + Antenna Pad Loss- Amplifier Gain

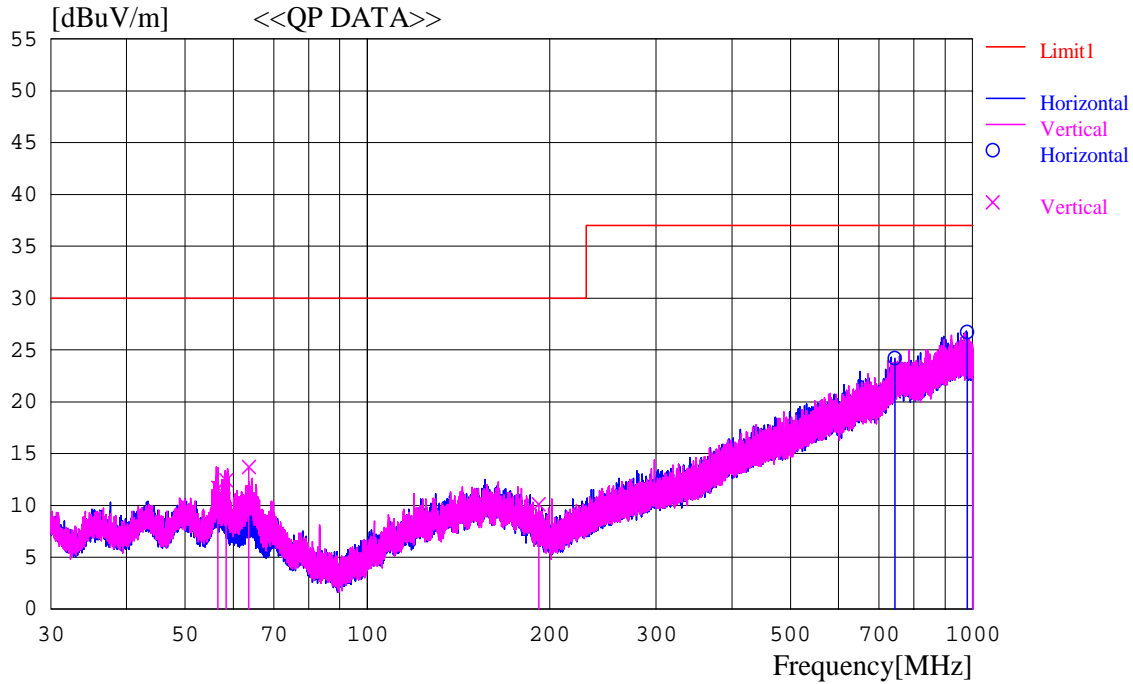
Margin = Limit - Emission Level

Level is rounded off to one decimal place.

BL = Bi-log Antenna

Operation mode	: Mode 2	Date	: Jan. 26 2014
Kind of equipment	: Heart Rate Activity Monitor	Temperature	: 24 °C
Model name	: PS-500	Humidity	: 36 %
Serial number	: ES50B00019	Location	: 10 m semi-anechoic chamber I
Comment	: Below 1 GHz	Distance	: 10 m
Detector	: QP	Engineer	: N. Hama

Limit1: [CISPR22] Class B (QP)



Frequency [MHz]	Meter Reading (QP) [dBuV]	Ant. Type	Detector	Antenna Factor [dB/m]	Total Loss [dB]	Level (QP) [dBuV/m]	Angle [degree]	Height [m]	Pola.	Limit [dBuV/m]	Margin [dB]
56.625	18.9	BL	QP	12.6	-19.8	11.7	125	1.00	Vert	30.0	18.3
58.475	19.7	BL	QP	12.5	-19.8	12.4	148	1.00	Vert	30.0	17.6
63.715	21.5	BL	QP	11.9	-19.7	13.7	172	1.00	Vert	30.0	16.3
192.000	17.7	BL	QP	10.5	-18.1	10.1	94	1.00	Vert	30.0	19.9
743.100	16.7	BL	QP	22.3	-14.8	24.2	34	1.47	Hori	37.0	12.8
979.100	16.5	BL	QP	23.7	-13.5	26.7	219	2.58	Hori	37.0	10.3

Note: All other emissions in the frequency range from 30 MHz to 1 GHz are more than 10 dB below the limit.

Level = Meter Reading + Antenna Factor + Total Loss

Total Loss = Cable Loss + Antenna Pad Loss- Amplifier Gain

Margin = Limit - Emission Level

Level is rounded off to one decimal place.

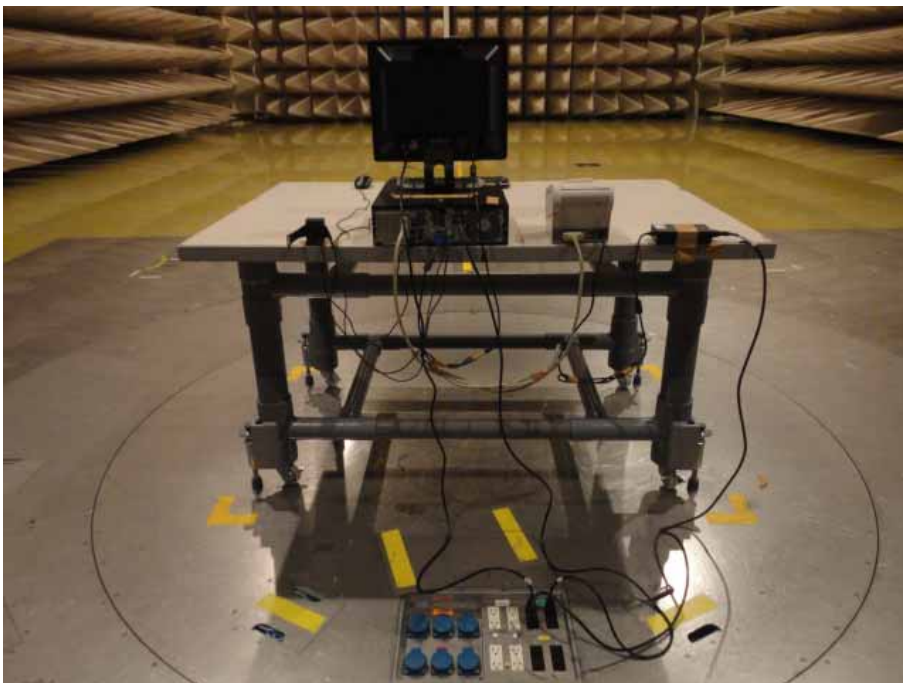
BL = Bi-log Antenna

## 5.4 Photographs of radiated disturbance emission

(Mode 1)



Front view

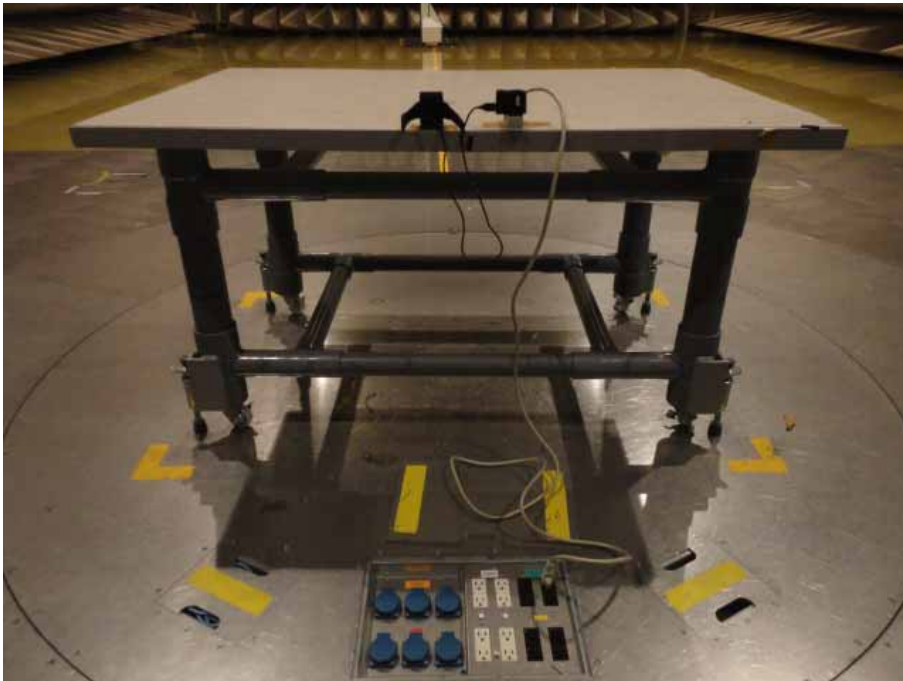


Rear view

**(Mode 2)**



**Front view**



**Rear view**

Test set-up complies with ANSI C63.4 (2003).

This configuration of the equipments and cables produces the highest radiated disturbance emissions.



## 6. LIST OF UTILIZED TEST EQUIPMENT

The utilized instruments are calibrated by a body that can provide traceability to a national standard.

### Conducted disturbance emission

Instrument / facility	Manufacturer	Model Number	Serial Number	Last calibrated Date	Period (Month)
Spectrum analyzer	Hewlett-Packard	8568B	2928A04795	Jun. 11 2013	13
Test receiver	Rohde & Schwarz	ESCS30	833364/007	Dec. 4 2013	13
Attenuator (10dB)	Huber+Suhner	6810.01.A	-	Nov. 7 2013	13
Step attenuator	Hewlett-Packard	8494A	2631A10189	Nov. 7 2013	13
Coaxial cable (for conduction)	-	L-401-00091	-	Nov. 7 2013	13
Coaxial switch	Agilent Technologies	8761A	0001-7167	Nov. 7 2013	13
Coaxial switch	Anritsu Corporation	MP-59B	-	Nov. 7 2013	13
AMN(LISN) (EUT side)	Rohde & Schwarz	ESH2-Z5	100126	May 18 2013	13
Wooden table	-	1.0mx1.5mx0.8m(H)	-	-	-
EMI measurement software	Internally-developed	Chart_ESA.xls	1.09	-	-

### Radiated disturbance emission (Below 1 GHz)

#### 10m semi-anechoic chamber I

Instrument / facility	Manufacturer	Model Number	Serial Number	Last calibrated Date	Period (Month)
Spectrum analyzer	Agilent Technologies	N9010A	MY51250430	Dec. 20 2013	13
Test receiver	Rohde & Schwarz	ESCS30	826547/029	Aug. 12 2013	13
Preamplifier	Hewlett-Packard	87405A	3207A00888	Mar. 29 2013	13
Attenuator (3dB for d=10m)	Hewlett-Packard	8491A 003	-	Mar. 29 2013	13
Step attenuator	Hewlett-Packard	8494A	2813A16777	Mar. 29 2013	13
Coaxial cable (for d=10m)	-	L-401-00008	-	Mar. 29 2013	13
Coaxial switch	Anritsu Corporation	MP-59B	-	Mar. 29 2013	13
Coaxial switch	Rohde & Schwarz	PSU	843265/006	Mar. 29 2013	13
Bi-Log antenna	Schwarzbeck	VULB9168	119	Jun. 13 2012	24
Semi-anechoic chamber (10m)	Riken eletech corporation	L-060-00001	NSA	Mar. 24 2013	13
Plastic table	-	1.0mx1.5mx0.8m(H)	-	-	-
EMI measurement software	TSJ Corporation	TEPTO-DV/RE	1.05.0034	-	-

Note: \*Date of normalized site attenuation (NSA) measurement.

**-The end of this test report-**