

SAMSUNG ELECTRONICS CO., LTD.

Test Report

Performance Evaluation Test of SPI (Samsung Super Plasma Ion)
Device for MR S A

SAMSUNG ELECTRONICS

KRCES-Bio. Test Report No. 20_0002_3
October 30, 2008

Toshihiro Itoh
Managing Director

Kitasato Research Center for Environmental Science
1-15-1, Kitasato, Sagamihara, Kanagawa, Japan



The contents of this report should not be disclosed to the public without prior consent of the Kitasato Research Center of Environmental Sciences. The test results shown here are applied to only test samples and do not guarantee quality of the whole batch (lot) of the test material.

1. Test objectives

To evaluate the eradication performance of SPI (Samsung Super Plasma Ion) device for airborne bacteria.

2. Client

Name : SAMSUNG ELECTRONICS CO., LTD.

Address : 416, Maetan-3Dong, Yeongtong-Gu, Suwon-City, Gyeonggi-Do, Korea 443-742

3. Test Laboratory

Name : Kitasato Research Center for Environmental Science

Address : 1-15-1 Kitasato, Samigahara, Kanagawa, Japan 228-0829

Investigator : Akira Okaue, Biotechnology Section, Microbiology Division

4. Test date

June 20, 2008

5. Test device

SPI (Samsung Super Plasma Ion) Device ① (Blast air volume : 0.84m³/min)

6. Test condition

- SPI (Samsung Super Plasma Ion) Device OFF (Blast fan only, control)
- SPI (Samsung Super Plasma Ion) Device ① (Device only)

7. Test bacteria

Staphylococcus aureus IID 1677

8. Methods

8-1. Test apparatus

Two circulation fans (0.2m³/min) were put on the corner of 1m³ (1×1×1m) test chamber. Two holes were made at the center of side panel of the test chamber. A nebulizer and an impinger were connected to the holes. The nebulizer and impinger were used to atomize test bacteria and to collect test bacteria, respectively. The test device was set up under the prescribed condition in the test chamber (fig. 2, photo. 1).

8-2. Culture of the test bacteria

The test bacteria were pre-cultured, and subcultured in addition for 24 hours at 35°C with TSA (Tryptic Soy Agar, Difco). The formed colony was suspended in the sterilized ion exchange water, so that the number of bacteria might become about 10⁹ CFU/mL.

8-3. Spray of the bacterial suspension, Collection of airborne bacteria

The compressor supplied the compressed air to the nebulizer containing the bacterial suspension, and bacterial suspension were sprayed to test chamber at an air flow rate of approximately 0.15mL/min. Impinger containing 20 mL of sterilized saline was used to collect airborne bacteria, and sampling time for each collecting point was 2 minutes (Total volume; 5 L/minutes=10 L).

8-4. Operation

According to the chart of operations, circulation fan placed in the chamber was turned on, and the bacterial-containing aerosols were also generated for 10 minutes into the

chamber. After one minute, bacterial aerosol was collected as a sample at time 0 (concentration of airborne bacteria at the starting point), and the test device was turned on. The aerosol was collected at 30, 60, 90, 120, and 150 minutes.

8-5. Count of bacterial number

After sampling, decimal dilutions of the each collected bacterial solution were prepared with saline. 1mL of the each dilution was transferred to Petri dishes, 20 mL of TSA medium was poured, swirled plates to mix, and let solidify. 10 mL and the remainder of the collected bacterial solution in impinger were filtered with membrane filter, and the resultant filter was transferred onto the surface of TSA medium, and incubated at 35°C for 48 hours. Colonies were counted, and probable bacterial number in 10 L of air was calculated.

8-6 Measurement of ozone concentration

Concentration of ozone was measured by detector tube method. At the same time when airborne bacteria were collected, concentration of ozone in 500 mL of the air was examined.

9. Results

Table 1 showed number of airborne bacteria at each operation time.

Fig 1 showed inclination of approximation curve (=change of number of airborne bacteria (log scale) per minute) calculated from the data of Table 1.

In addition to this, particle number and humidity in each test were shown as reference data.

As shown in Fig 1, inclinations of approximation curve of SPI Device OFF and SPI Device ① (Device only) in bacterial number were -0.0078 and -0.021, respectively.

The logarithm value can be read in a different way as the change of the digit number for the number of airborne bacteria. Therefore, the decreasing of number of airborne bacteria for 150 min from the starting point was 1.17 digit (=93.2% reduction) for SPI Device OFF and 3.15 digit (=99.929% reduction) for SPI Device ① (Device only).

Bacterial number of SPI Device ① at 150 min was 1.98 digits (=99.0%) fewer than that of SPI Device OFF set as a control.

Table 2 showed the concentration of ozone. Because these values were less than 0.05 ppm, no generation of ozone from device was observed.

Table1. Result of performance evaluation test of test device for airborne bacteria (Unit:CFU/10L-Air)

Test device	Operating time (min) of test device					
	0	30	60	90	120	150
SPI Device :OFF (control)	10,000,000	6,400,000	3,000,000	1,900,000	1,200,000	680,000
SPI Device ① (Device only)	10,000,000	1,400,000	400,000	78,000	26,000	6,000

※Test bacteria: *Staphylococcus aureus* IID 1677 (MRSA)

※Test device: SPI (Samsung Super Plasma Ion) Device①(Blast air volume:0.84m³/min) (Device only)

Position : 20cm from the corner, Height : 50cm, Direction : Diagonal, Angle : 10°

Table2. Result of ozone concentration

Test device	Operating time (min) of test device					
	0	30	60	90	120	150
SPI Device :OFF (control)	<0.05ppm	<0.05ppm	<0.05ppm	<0.05ppm	<0.05ppm	<0.05ppm
SPI Device ① (Device only)	<0.05ppm	<0.05ppm	<0.05ppm	<0.05ppm	<0.05ppm	<0.05ppm

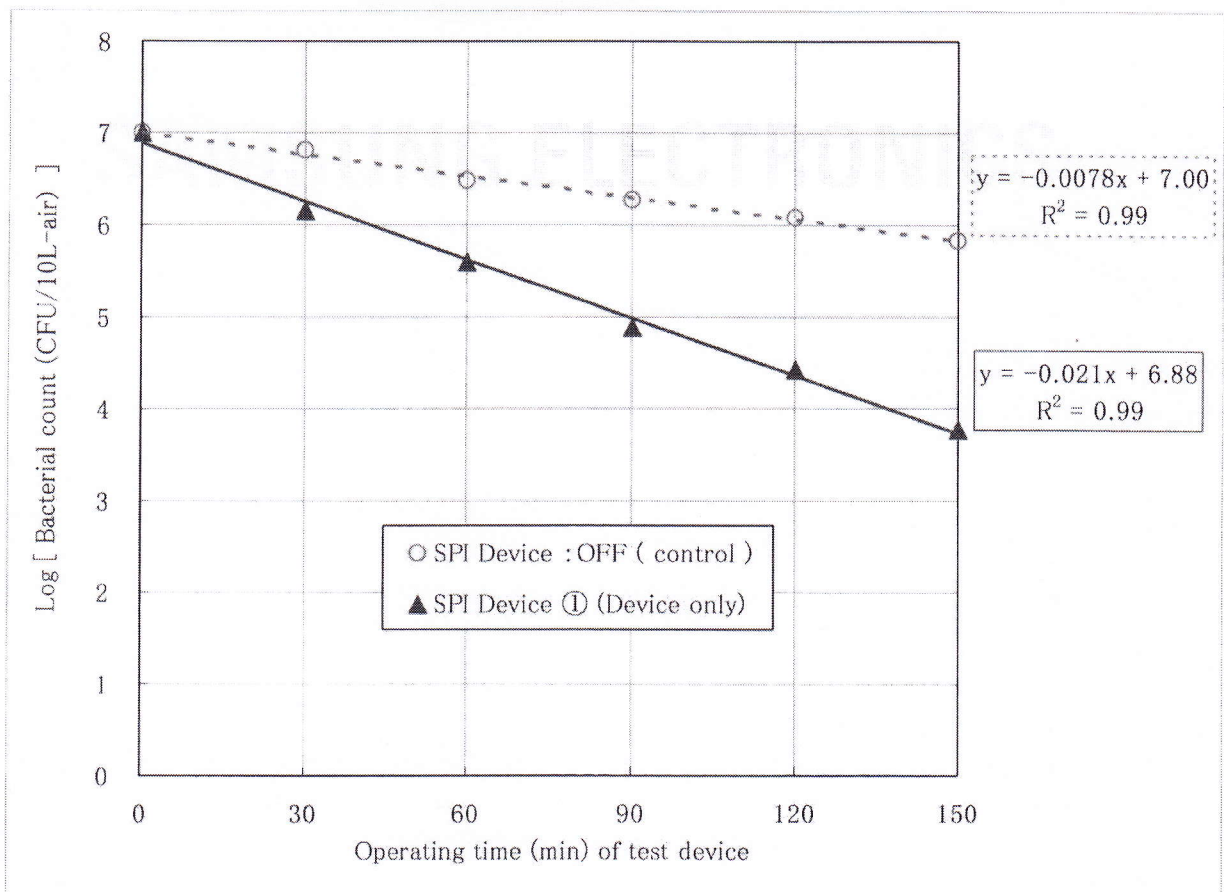


Figure1. Result of performance evaluation test of test device for airborne bacteria

Table 3. Test process

Apparatus	Operation	Operation time (min) of test device					
		0	30	60	90	120	150
Circulation fans	To make homogeneous air in chamber						
Nebulizer	Splay bacteria	10min 1min stir					
Test device (Device only)	Blowing fan						
	Plasma generation						
ON/OFF is switched according to the condition							
Impinger	Collect airborne bacteria	10L	10L	10L	10L	10L	10L

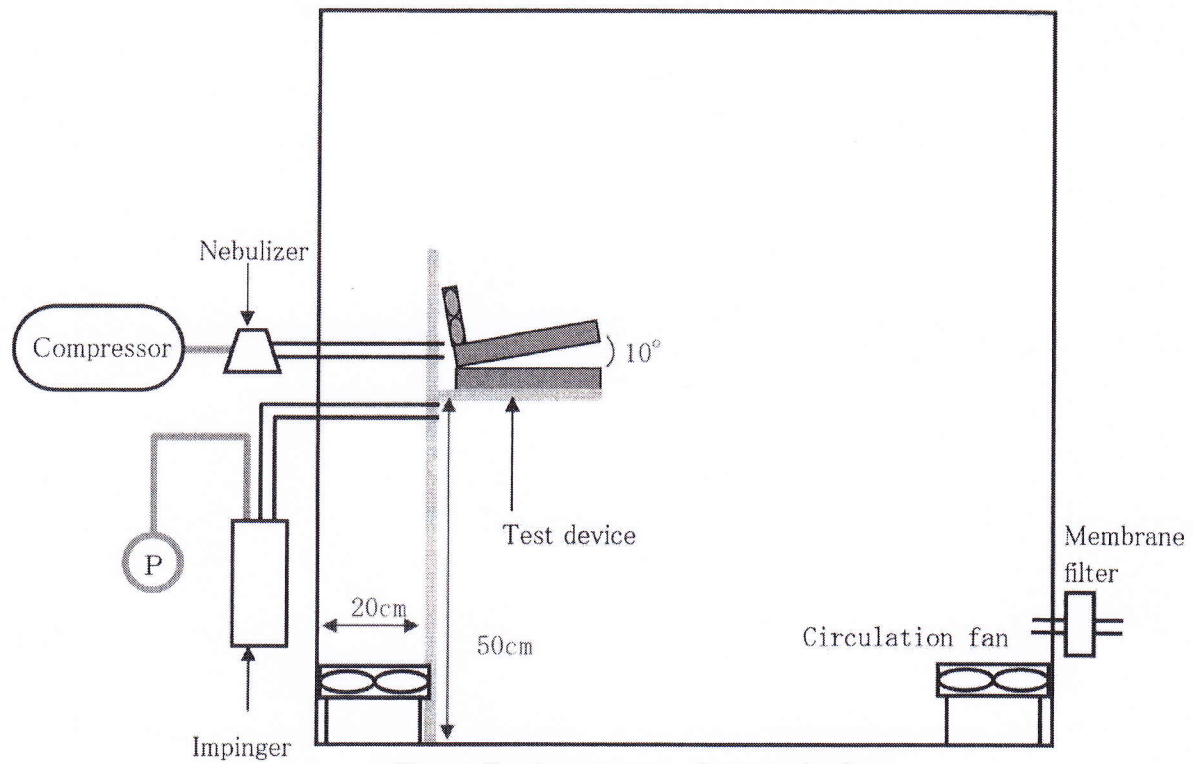


Figure 2. Appearance of test chamber

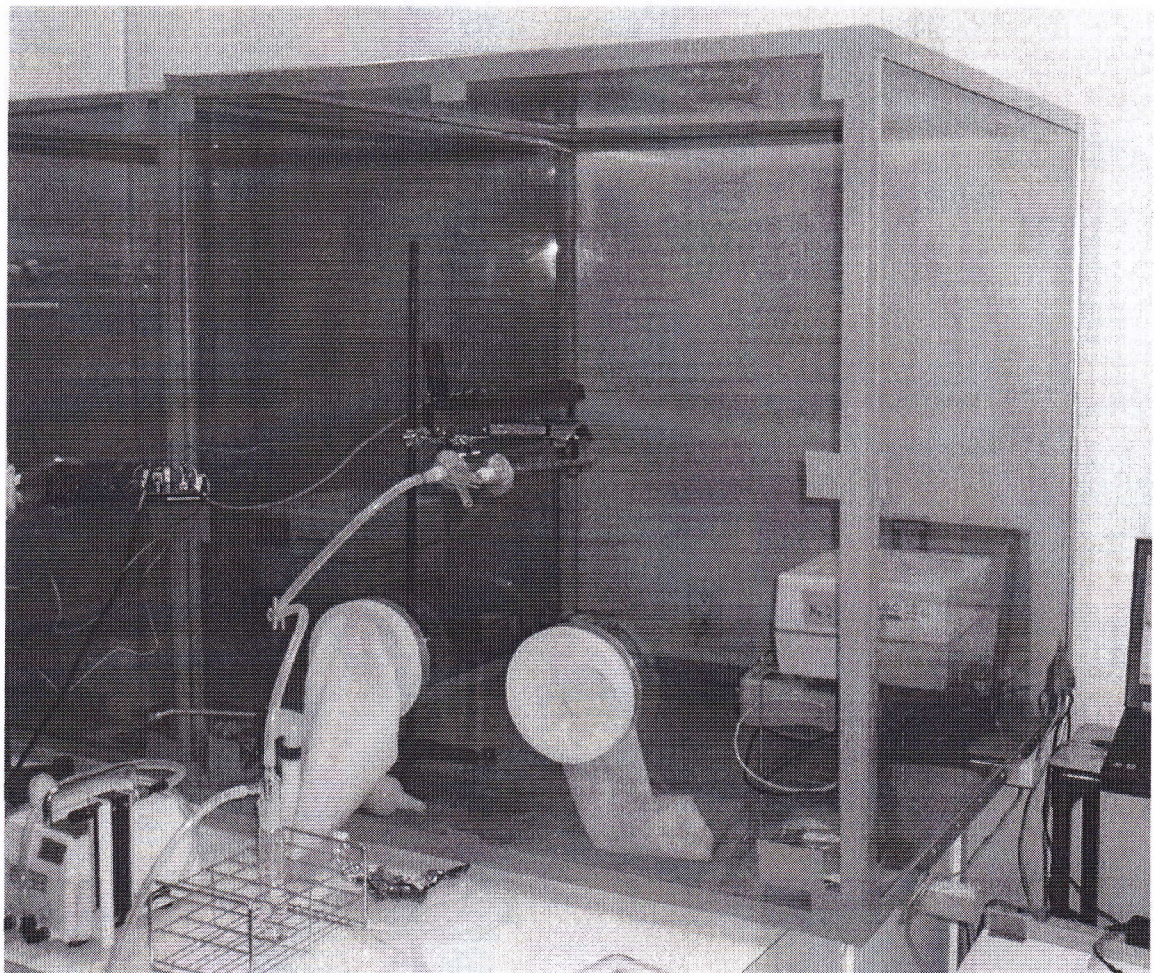
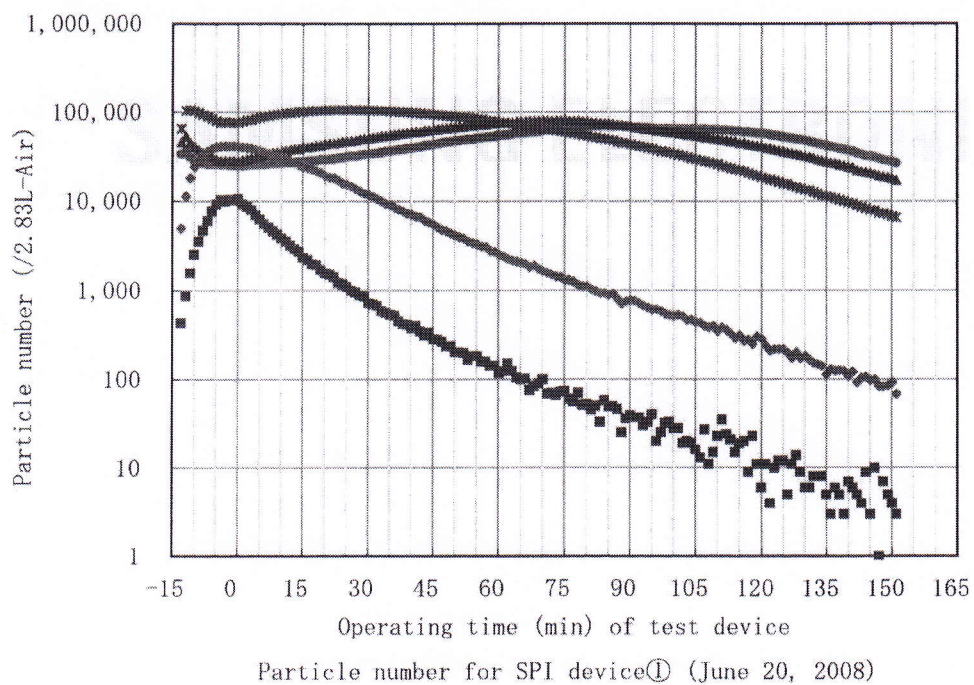
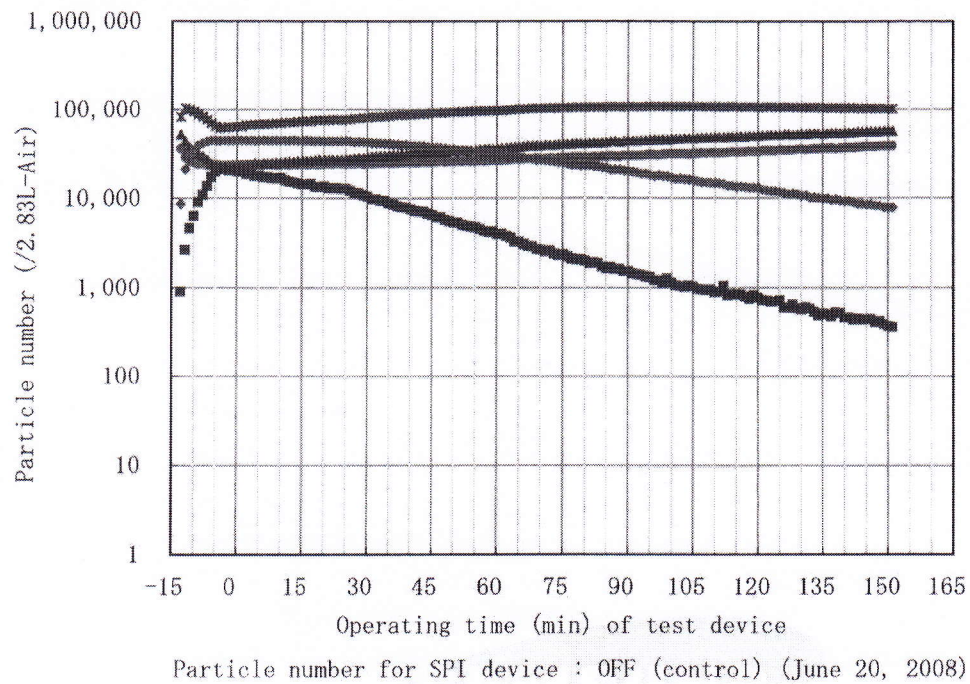


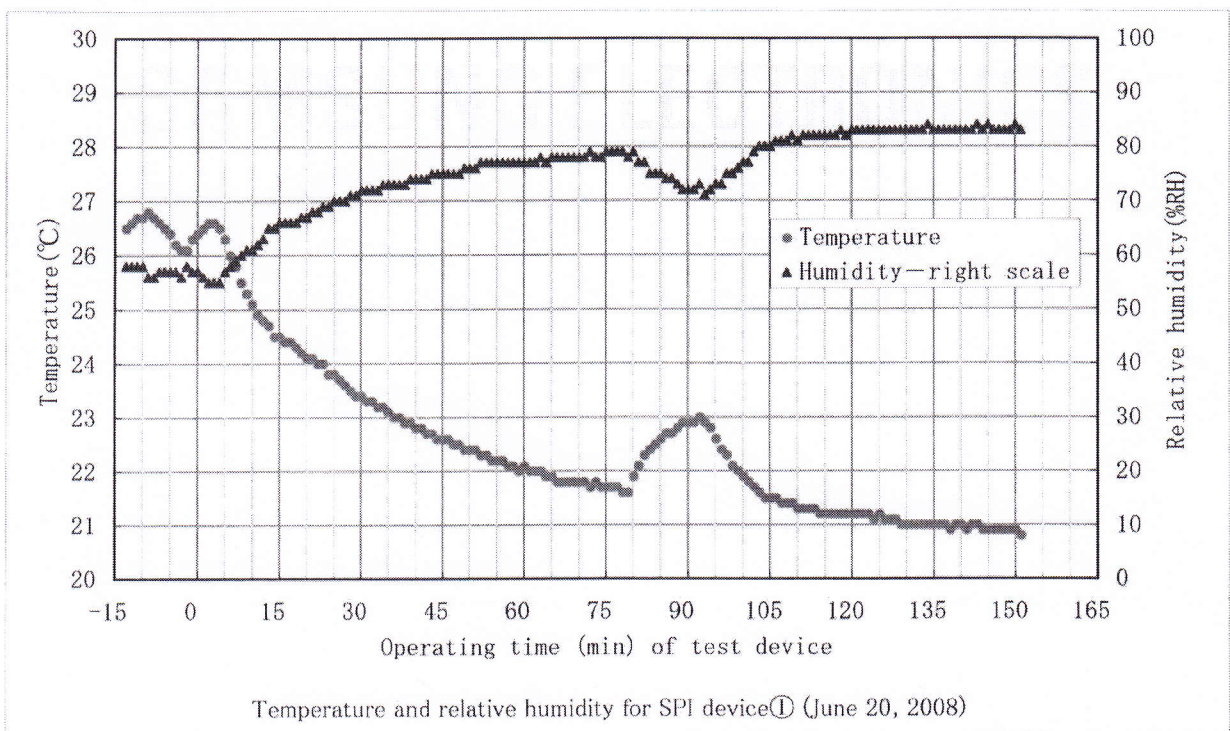
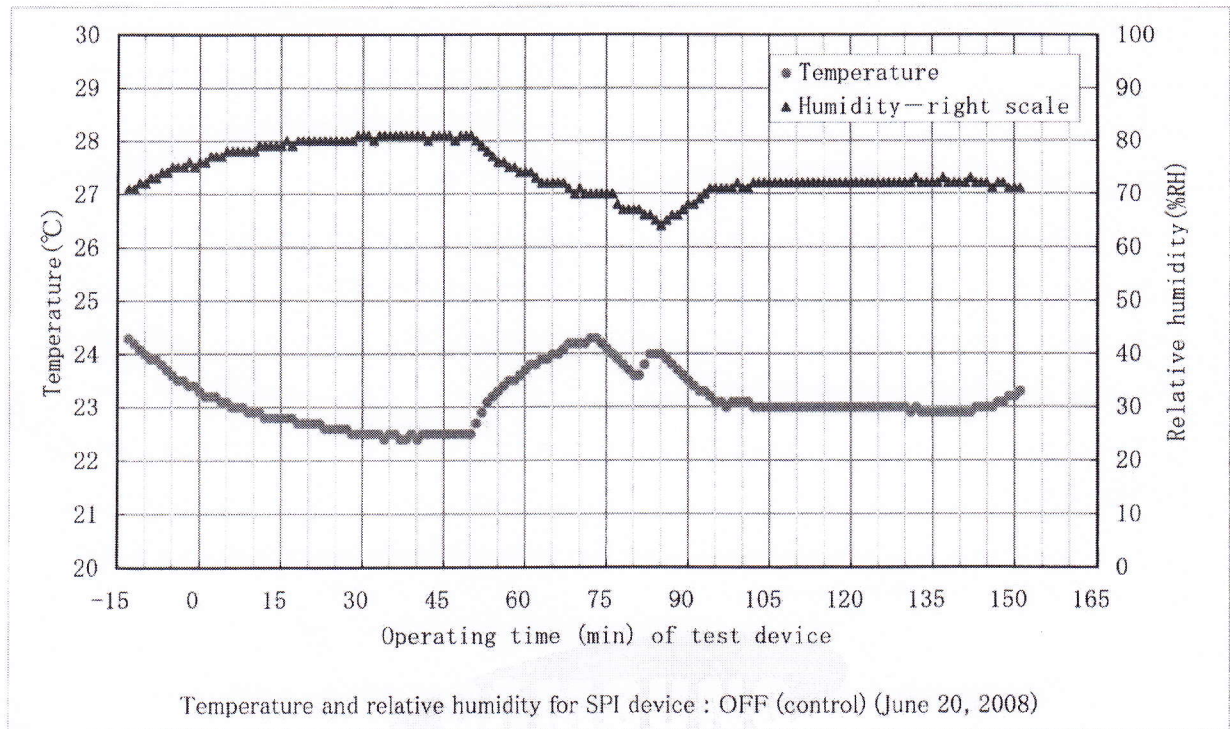
Photo 1. Appearance of test chamber

Reference



Particle counter : Kanomax Japan, Inc. MODEL 3886

Reference



Thermohygrometer : Chino Corporation MR6661