Comparisons of SEIDO1-16, SEIDO5-16 and SEIDO10-20

1 Setup for test

A photo of the setup for the test for SEIDO1-16, SEIDO5-16 and SEIDO10-20 is show in Fig.1. The thermal performances and the collector efficiencies are tested with different inlet temperatures in a laboratory facility. The inlet temperatures to the three collectors are the same. The flow rate is 1.2l/min per square meter. The aperture areas for the three collectors are shown in table 1.

Fig.1 Photo of the experimental setup for SEIDO1-16, SEIDO5-16 and SEIDO10-20

Table1. Collector areas for investigated collectors.

Collector	Aperture area (m^2)
SEIDO1-16	2.9305
SEIDO5-16	2.9300
SEIDO10-20	2.2091

2 Thermal performance

2.1 Daily thermal performances

The daily thermal performances and inlet temperatures measured in the period between the 8th of September 2011 and the 3rd of November 2011are shown in table2. Fig.2 and Fig.3 shows the daily solar

radiation and daily thermal performances measured in the period between the 8th of September 2011 and the 3rd of November 2011.

Table2 Measured daily thermal performances and mean temperatures of collector fluid for SEIDO1-16, SEIDO5-16 and SEIDO10-20

Date	Solar radiation (kWh/m^2)	Thermal performance (kWh/m^2)			Mean solar collector fluid temperature (^oC)		
		SEIDO1-16	SEIDO5-16	SEIDO10-20	SEIDO1-16	SEIDO5-16	SEIDO10-20
08/09/2011	3.43	1.94	2.08	2.05	41.9	43.3	41.3
09/09/2011	5.36	3.24	3.65	3.43	42.9	43.7	42.9
10/09/2011	2.11	1.16	1.33	1.23	36.3	37.3	36.9
11/09/2011	3.09	1.87	2.12	2.00	39.8	40.8	40.3
12/09/2011	2.30	1.26	1.48	1.35	36.5	37.5	37.1
13/09/2011	2.77	1.56	1.76	1.64	37.3	38.2	37.8
15/09/2011	3.08	1.67	2.05	1.80	36.3	37.4	36.9
16/09/2011	6.08	3.85	4.37	4.07	41.7	42.7	42.2
17/09/2011	0.80	0.23	0.35	0.30	31.4	32.5	32.2
18/09/2011	0.48	0.12	0.17	0.15	32.1	33.1	32.8
19/09/2011	4.91	2.97	3.28	3.09	40.6	41.6	41.1
20/09/2011	1.67	0.80	0.97	0.88	35.1	36.1	35.8
21/09/2011	0.17	0.02	0.04	0.04	30.5	31.6	31.4
22/09/2011	4.39	2.63	2.93	2.77	40.1	41.1	40.7
23/09/2011	3.19	1.74	2.07	1.87	39.2	40.7	40.1
24/09/2011	3.17	1.56	1.84	1.73	57.3	57.9	57.6
25/09/2011	5.24	2.91	3.27	3.14	62.2	62.9	62.5
26/09/2011	3.57	1.82	2.11	1.99	57.5	58.0	57.7
27/09/2011	5.26	3.03	3.36	3.42	58.4	58.9	58.7
28/09/2011	3.92	2.11	2.42	2.28	56.1	56.5	56.2
29/09/2011	4.86	2.84	3.16	3.00	58.7	59.4	59.0
30/09/2011	5.57	3.30	3.65	3.48	59.7	60.2	59.8
01/10/2011	5.07	2.49	2.76	2.67	82.8	82.8	83.4
02/10/2011	3.42	1.59	1.73	1.68	69.5	70.5	70.1
03/10/2011	3.30	1.62	1.68	1.63	66.5	67.3	67.2
04/10/2011	5.08	2.78	2.80	2.76	71.2	72.1	72.2
05/10/2011	1.61	0.86	0.91	0.85	35.9	36.9	36.4
06/10/2011	0.50	0.21	0.22	0.20	22.5	23.4	23.0
07/10/2011	2.51	1.34	1.47	1.36	40.9	41.3	40.8
08/10/2011	2.58	1.39	1.54	1.43	40.8	41.8	41.4

09/10/2011	3.03	1.59	1.73	1.60	45.5	45.5	45.5
10/10/2011	0.40	0.16	0.16	0.13	19.9	20.5	20.2
11/10/2011	4.20	2.77	2.42	2.29	56.5	55.3	55.3
12/10/2011	3.20	2.08	1.92	1.77	47.0	46.9	46.5
13/10/2011	4.78	2.94	2.71	2.59	66.5	64.9	65.3
14/10/2011	3.94	1.86	2.10	1.97	72.7	73.3	73.1
15/10/2011	5.11	2.50	2.78	2.67	75.2	75.9	75.8
16/10/2011	5.13	2.46	2.68	2.55	73.6	74.4	74.3
17/10/2011	3.95	1.82	2.05	1.94	70.2	71.0	70.8
18/10/2011	0.50	0.09	0.13	0.10	50.1	51.5	50.7
19/10/2011	2.73	1.19	1.32	1.24	58.4	59.2	58.7
20/10/2011	2.75	1.30	1.37	1.23	56.4	57.3	56.6
21/10/2011	3.41	1.95	1.83	1.72	66.0	65.5	65.2
22/10/2011	3.57	2.44	2.34	2.18	36.4	37.2	36.6
23/10/2011	4.29	2.90	2.84	2.62	37.0	37.7	37.0
24/10/2011	1.37	0.87	0.78	0.71	34.2	35.4	34.9
25/10/2011	3.76	2.53	2.52	2.32	37.0	37.7	37.1
26/10/2011	0.14	0.00	0.00	0.00	28.2	29.0	28.7
27/10/2011	0.10	0.02	0.01	0.01	31.5	32.2	32.0
28/10/2011	0.46	0.21	0.19	0.17	23.9	24.6	24.4
29/10/2011	0.53	0.26	0.21	0.18	23.7	24.4	24.2
30/10/2011	0.60	0.38	0.29	0.25	24.6	25.5	25.3
31/10/2011	0.29	0.15	0.11	0.09	24.0	24.7	24.5
01/11/2011	0.65	0.40	0.33	0.29	24.4	25.2	25.0
02/11/2011	0.29	0.12	0.09	0.07	23.5	24.2	23.9
03/11/2011	0.14	0.01	0.00	0.00	22.4	23.0	22.9
28/10/2011	0.46	0.21	0.19	0.17	41.9	43.3	41.3
Sum	159	87.9	94.4	87.1	52.2	52.9	52.8

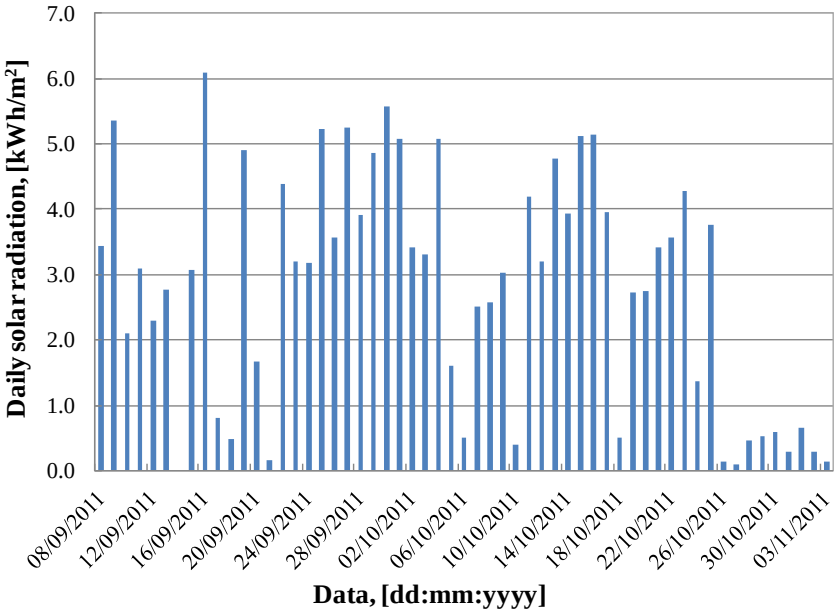

Fig.2 Daily solar radiation between the 8th of September 2011 and the 3rd of November 2011

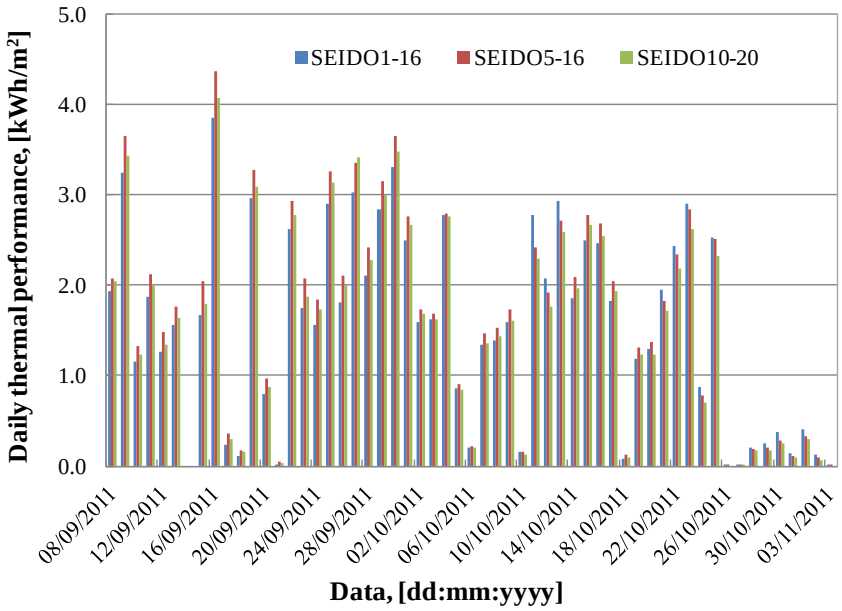

Fig.3 Daily thermal performances for SEIDO1-16, SEIDO5-16 and SEIDO10-20

2.2 Powers and mean temperatures of collector fluid

The solar irradiance and the powers and mean temperatures of collector fluid for SEIDO1-16, SEIDO5-16 and SEIDO10-20 in some typical day are shown in Fig.4-12

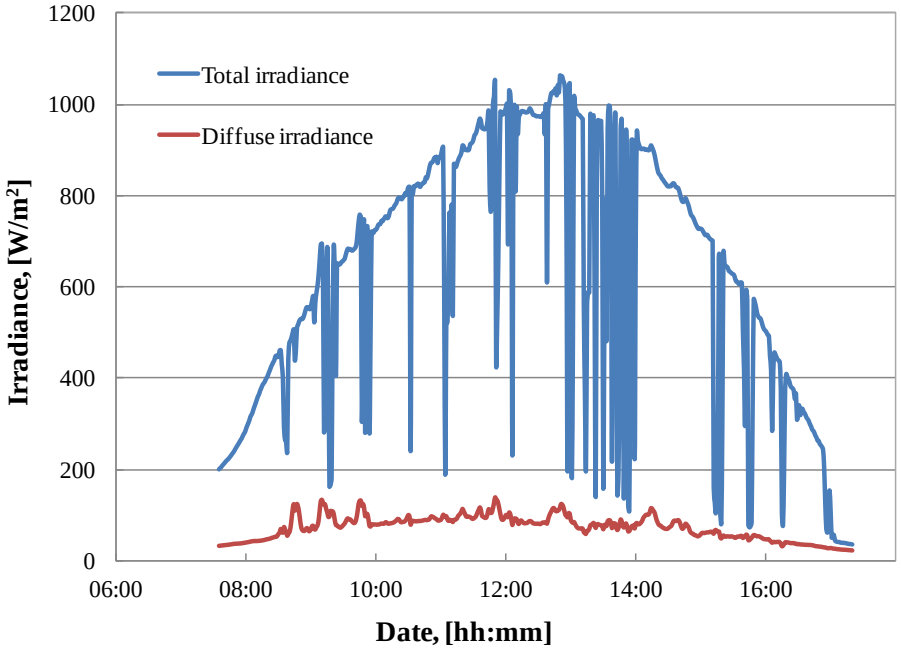

Fig.4 Solar irradiance on September 16, 2011

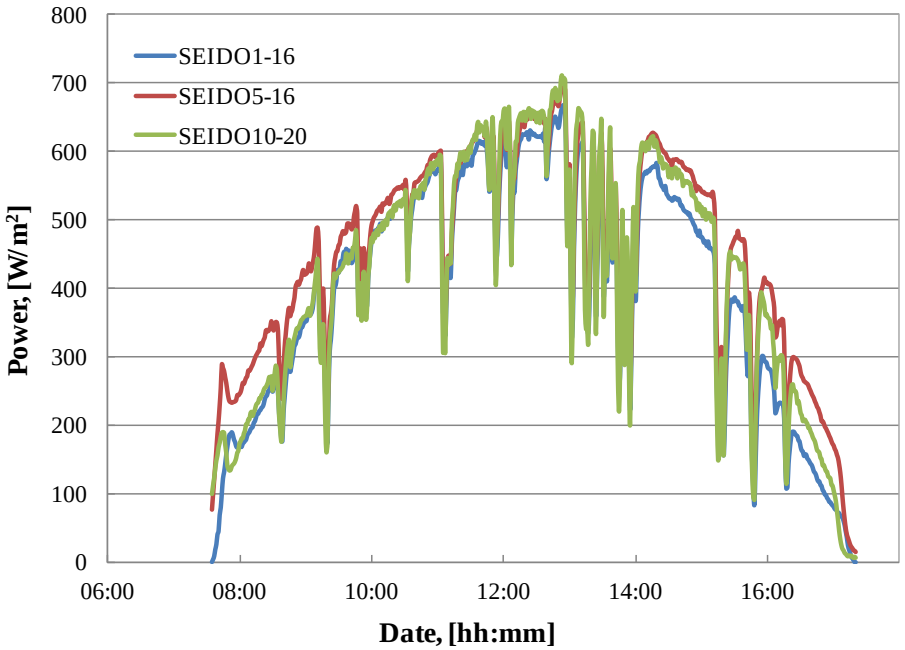

Fig.5 Powers for SEIDO1-16, SEIDO5-16 and SEIDO10-20 on September 16, 2011

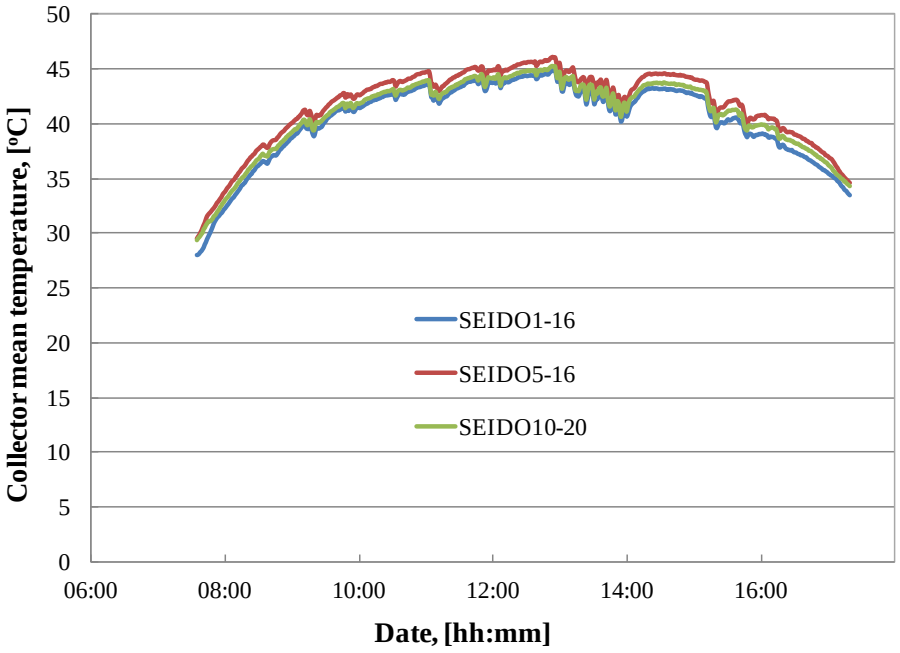

Fig.6 Mean temperatures of collector fluid for SEIDO1-16, SEIDO5-16 and SEIDO10-20 on September 16, 2011

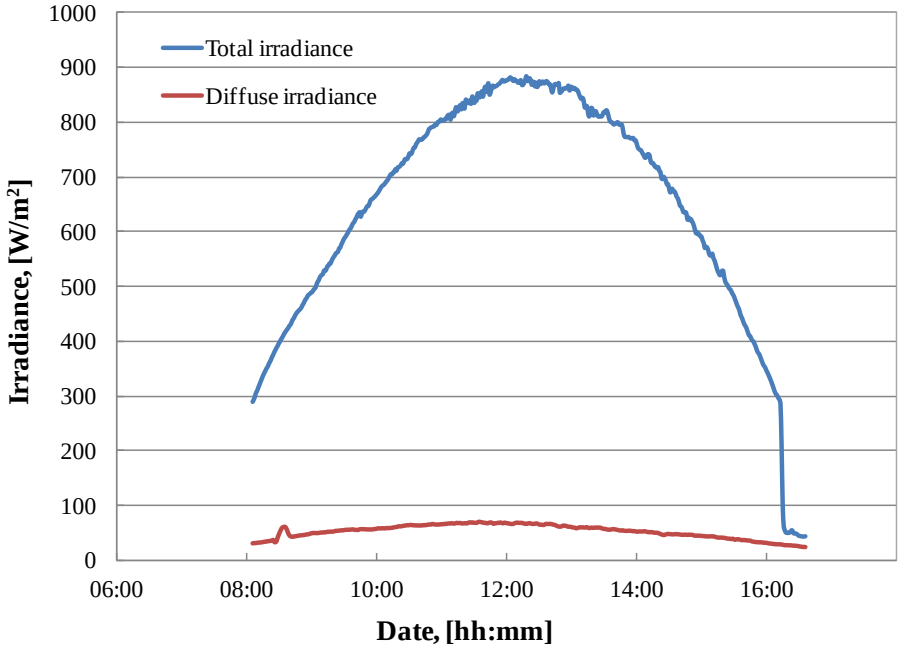

Fig.7 Solar irradiance on September 30, 2011

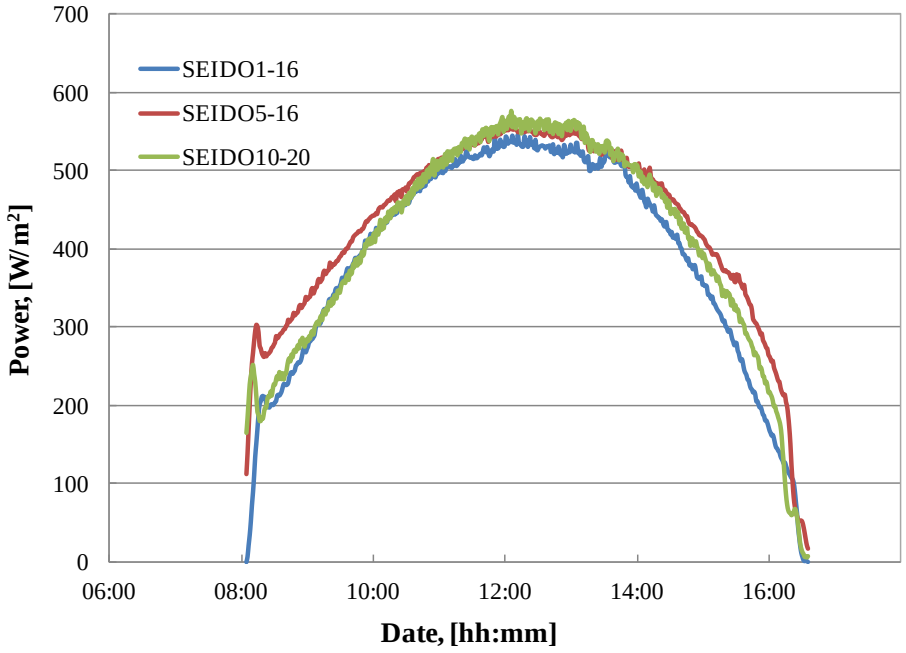

Fig.8 Powers for SEIDO1-16, SEIDO5-16 and SEIDO10-20 on September 30, 2011

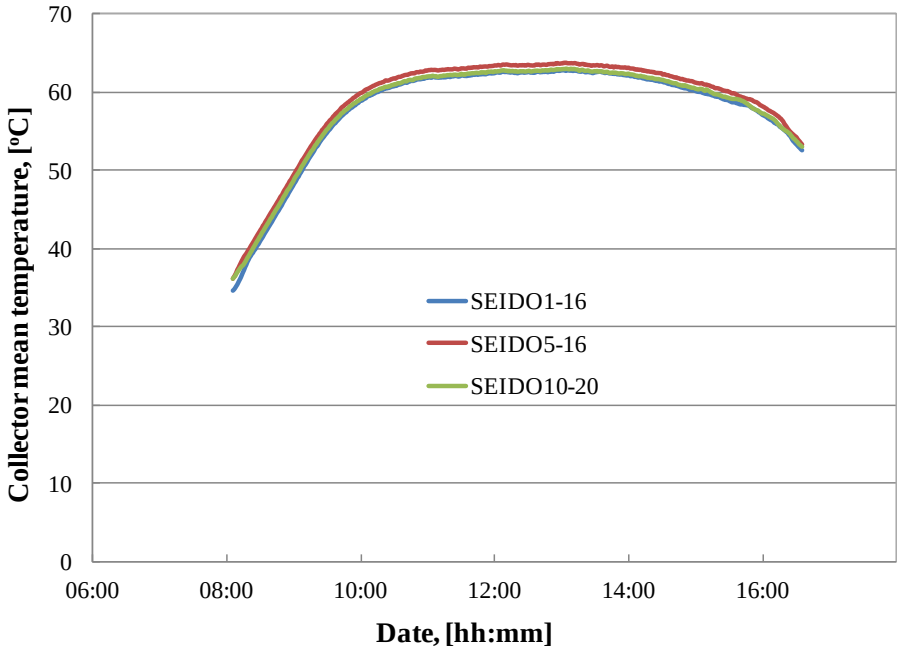

Fig.9 Mean temperatures of collector fluid for SEIDO1-16, SEIDO5-16 and SEIDO10-20 on September 30, 2011

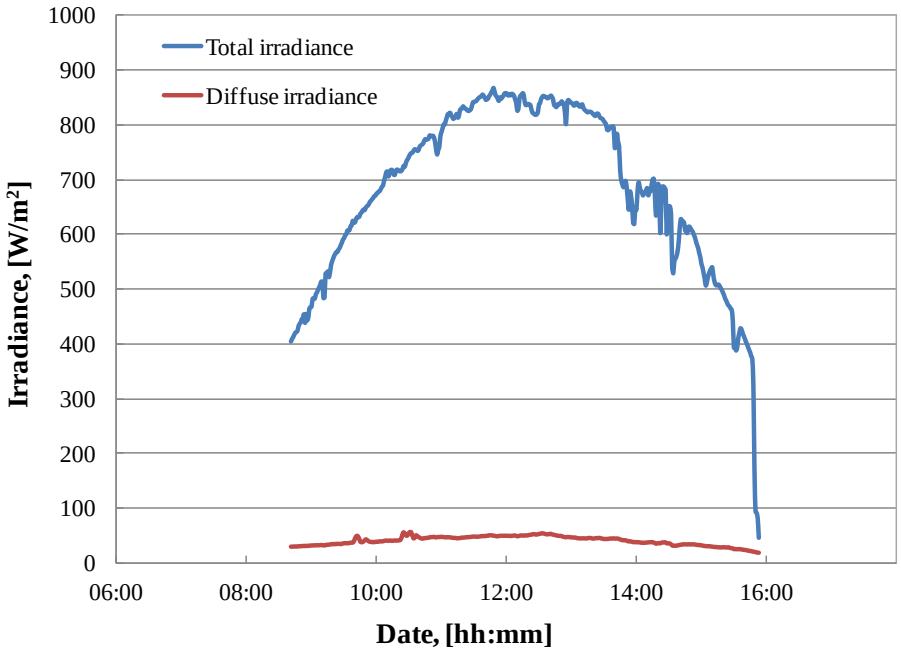

Fig.10 Solar irradiance on October 15, 2011

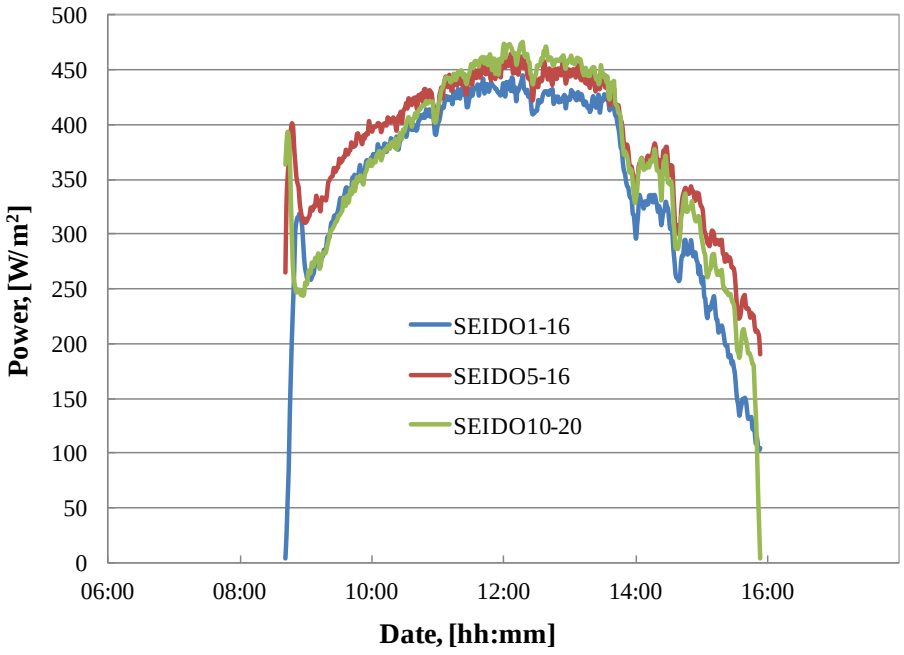

Fig.11 Powers for SEIDO1-16, SEIDO5-16 and SEIDO10-20 on October 15, 2011

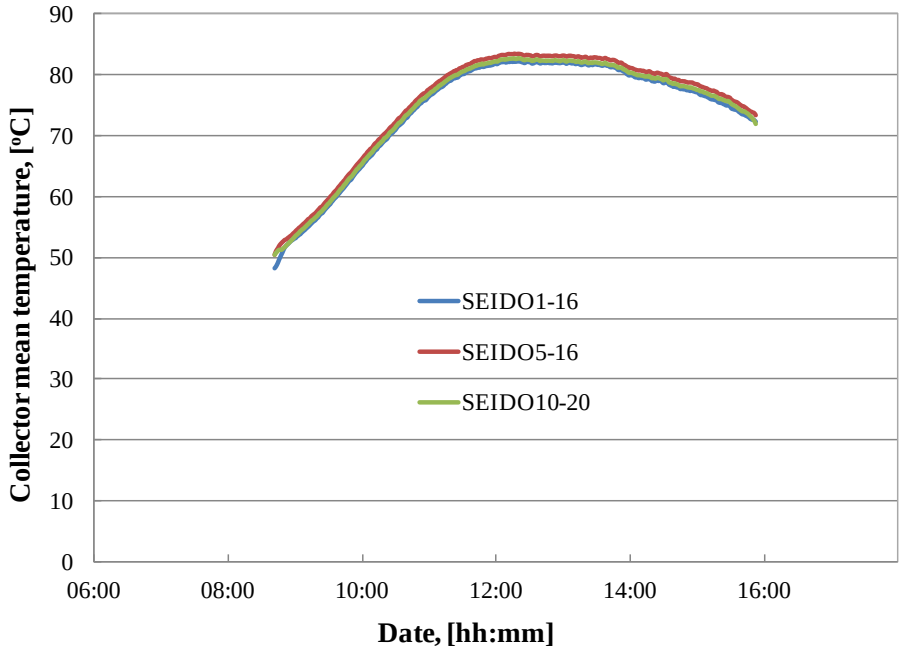

Fig.12 Mean temperatures of collector fluid for SEIDO1-16, SEIDO5-16 and SEIDO10-20 on October 15, 2011

3 Efficiency

3.1 Test for SEIDO1-16

Table2 Measurement data for SEIDO1-16

Date	Start time	End time	θ	G	T_a	Flow	T_{in}	T_{out}- T_{in}	T_m	$(T_m-T_a)/G$	η
d-m-y	hh:mm	hh:mm	°	W/m^2	°C	l/min	°C	K	°C	Km^2/W	-
29-09-2011	12:09	12:24	14.1	844	21.9	3.8	59.2	5.7	62.0	0.0476	0.61
30-09-2011	11:23	11:38	14.4	843	22.7	3.8	59.1	5.8	62.0	0.0467	0.62
30-09-2011	12:37	12:52	18.5	865	24.0	3.8	59.6	5.9	62.5	0.0446	0.61

3.2 Test for SEIDO5-16

Table3 Measurement data for SEIDO5-16

Date	Start time	End time	θ	G	T_a	Flow	T_{in}	T_{out}- T_{in}	T_m	$(T_m-T_a)/G$	η
d-m-y	hh:mm	hh:mm	°	W/m^2	°C	l/min	°C	K	°C	Km^2/W	-
29-09-2011	12:09	12:24	14.1	844	21.9	3.8	60.0	5.9	63.0	0.0488	0.63
30-09-2011	12:23	12:38	16.3	871	23.7	3.8	60.3	6.2	63.4	0.0456	0.63

3.3 Test for SEIDO10-20

Table4 Measurement data for SEIDO12-20

Date	Start time	End time	θ	G	T_a	Flow	T_{in}	T_{out}- T_{in}	T_m	$(T_m-T_a)/G$	η
d-m-y	hh:mm	hh:mm	°	W/m^2	°C	l/min	°C	K	°C	Km^2/W	-
29-09-2011	12:09	12:24	14.1	844	21.9	3.4	59.8	5.0	62.3	0.0479	0.63
30-09-2011	12:23	12:38	16.3	871	23.7	3.4	60.1	5.2	62.7	0.0448	0.64

3.4 Comparisons and Analysis

The measured efficiencies for SEIDO1-16, SEIDO5-16 and SEIDO10-20 and comparison with the efficiencies tested in Fraunhofer Institute in 2006 and in SPF are shown in Fig.12.

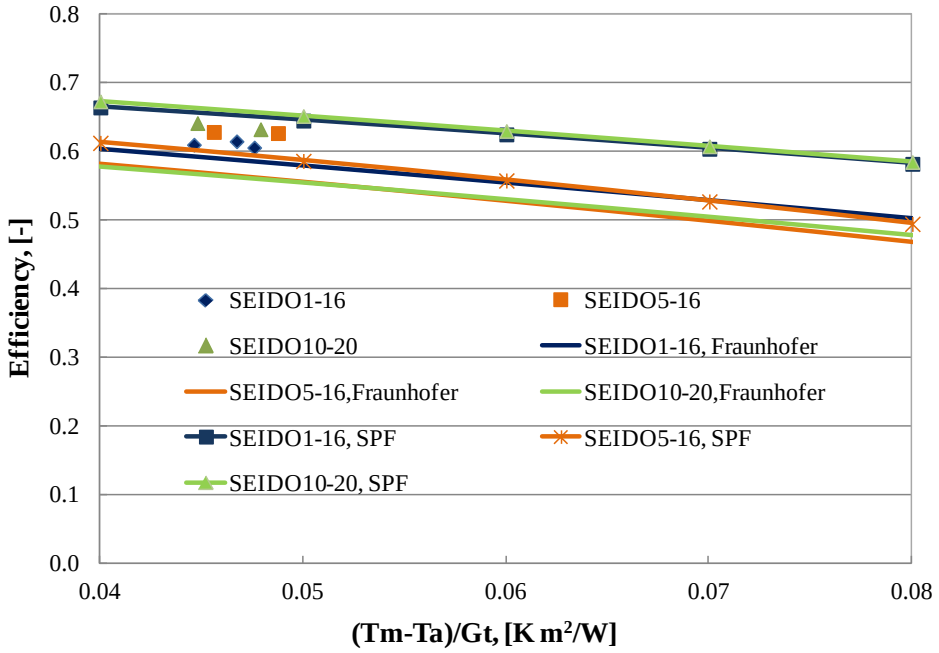

Fig.12 Measured efficiencies for SEIDO1-16, SEIDO5-16 and SEIDO10-20 and comparing with the efficiencies tested in Fraunhofer Institute and in SPF.