

IES LM-80 Test Report

Report Issue Date : January 21, 2019	Report Number : I-180126-004-K-01
Testing Start Date : January 30, 2018	Testing Completion Date : November 14, 2018
Revision Number : 01	Test Duration : 6 000 h

Manufacturer Information :

Applicant : Seoul Semiconductor Co., LTD
Address : 97-11, Sandan-ro 163, Danwon-gu, Ansan, Gyeonggi-do, Korea 15429

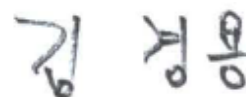
Description of Test Samples :

Classification : LED Package
PKG Name : 5050
Part Number : STWxL60A
Drive Current : 340 mA

Test Procedure :

IES LM-80-08 Approved Method for Measuring Lumen Maintenance of LED Light Sources

Tested by



KyungYong KIM, Research Engineer

Approved by

YoungJoon WON, Laboratory Manager



Seoul Semiconductor Testing Laboratory(KT-484) is accredited to ISO/IEC 17025:2005 for the above test procedure by KOLAS, Republic of KOREA which is a signatory to ILAC-MRA.

Seoul Semiconductor Testing Laboratory

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Applicable Series Model Numbers

This LM-80 report is applicable to the following

Model Name	Forward Current	Typical VF	Power	LED Number	Power Density	Current Density	Minimum Spacing	CCT
STWxL60A Tested	340 mA	9.1 V	3.1 W	6	0.12 W/mm ²	155 mA/mm ²	0.2 mm	≥2200 K
STWxL6PA	510 mA	5.9 V	3.0 W	6	0.12 W/mm ²	155 mA/mm ²	0.2 mm	≥2200 K

※ 'x' means CRI & can contain 7, 8 and 9.

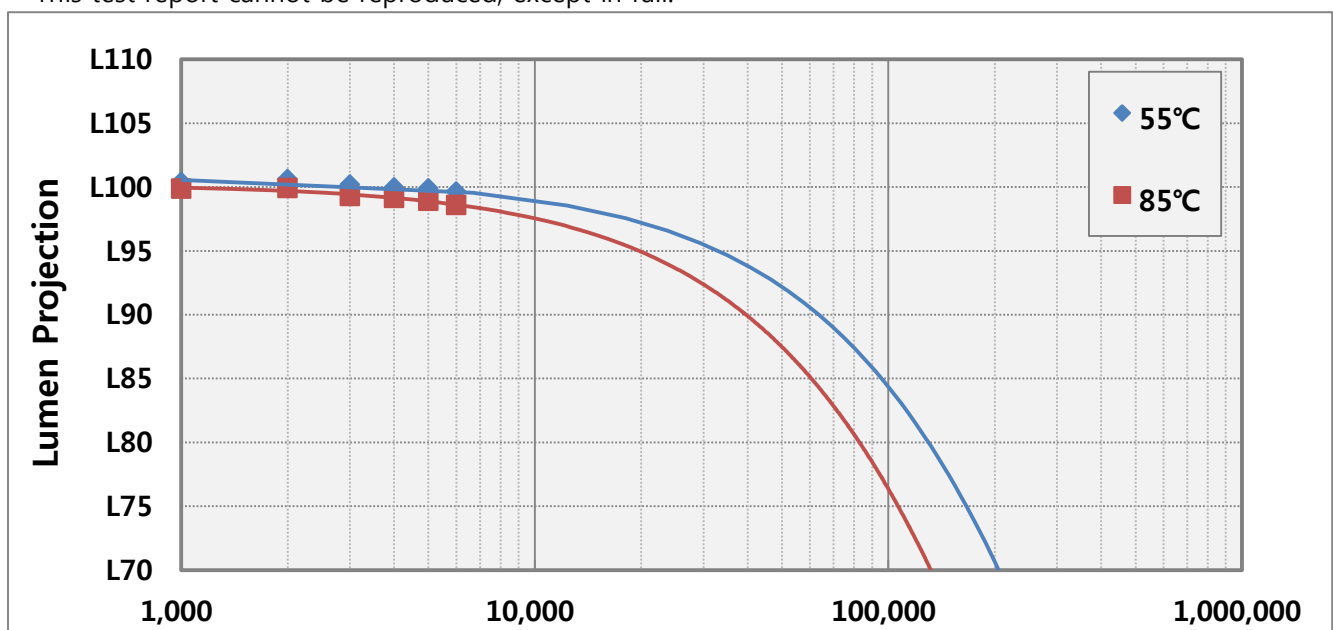


SEOUL SEMICONDUCTOR

1. Test Summary

Items	Nominal Case Temperature		
	55 °C	85 °C	
Number of LED tested	25	25	
Drive and Measurment Current	340 mA	340 mA	
Test Duration	6 000 h	6 000 h	
Actual Case Temperature	≥53.1 °C	≥83.6 °C	
Actual Ambient Temperature	≥50.2 °C	≥82.9 °C	
Air Flow Velocity	≤0.63 m/s	≤0.41 m/s	
Averaged Initial Luminous Flux	446.5 lm	446.9 lm	
Initial Nominal CCT	2700 K	2700 K	
Average Initial CRI	81	81	
Total Input Power	3.1 W	3.1 W	
Average Current Density (mA/mm ²)	155	155	
Average Power Density (W/mm ²)	0.12	0.12	
Minimum Spacing from die edge to die edge	0.2 mm	0.2 mm	
Average Lumen Maintenance	99.6 %	98.6 %	
Average Chromacity Shift	0.000 6	0.001 0	
α	1.775E-06	2.723E-06	
B	1.007	1.002	
TM-21 Projection L ₇₀	>36000	>36000	
TM-21 Projection L ₈₀	>36000	>36000	
TM-21 Projection L ₉₀	>36000	>36000	

※ The results shown in this certificate refer only to the sample(s) tested unless otherwise stated.
This test report cannot be reproduced, except in full.



2. IES LM-80-08 Test Report Requirement :

Number of LED Light Sources Tested

See the Test Summary

Description of LED Light Sources

See the Description of Test samples at the cover of certificate

Description of auxiliary equipment

Active cooling Test System

Temperature controlling chamber for LED package/array/module consists of the water cooling heat-sink plates to control the case temperature of each device and of the power supply required by LM-80 test conditions.

Measurement System

Photometric measurement tester for LED package/array/module consists of the integrating sphere with temperature controlling system(TEC) and of programmable current source meter.

Operating Cycle

Constant Direct Current (DC)

Ambient Conditions Including Airflow, Temperature and Relative Humidity

Airflow : < 1 m/s

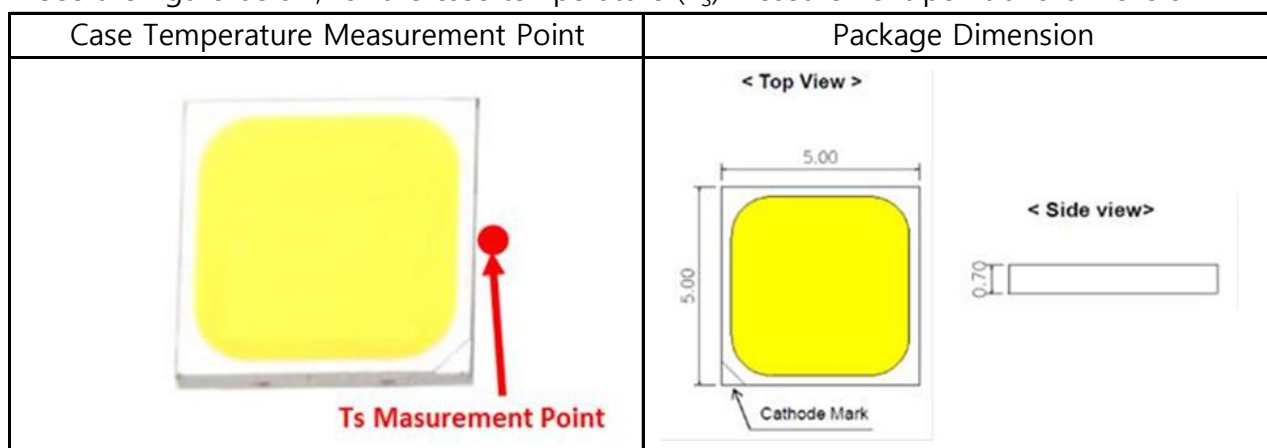
Ambient temperature : ≥ -5 °C of Nominal T_A

(See the Test Summary for actual T_A)

Relative Humidity : $\leq 65\%$ RH

Case Temperature (Test Point Temperature)

See the figure below, for the case temperature (T_S) measurement point and dimension



Drive Current of the LED Light Source During Lifetime Test

See the Test Summary

Initial Luminous Flux and Forward Voltage at Photometric Measurement Current

See the Test Summary

Lumen Maintenance Data for Each Individual LED Light Source Along with Median Value, Standard Deviation, Minimum and Maximum Lumen Maintenance Value for All of the LED Light Sources

See the table of each data set

Observation of LED light Sources Failures

No failure observed

LED Light Source Monitoring Interval

See the table of each data set

Photometric Measurement Uncertainty

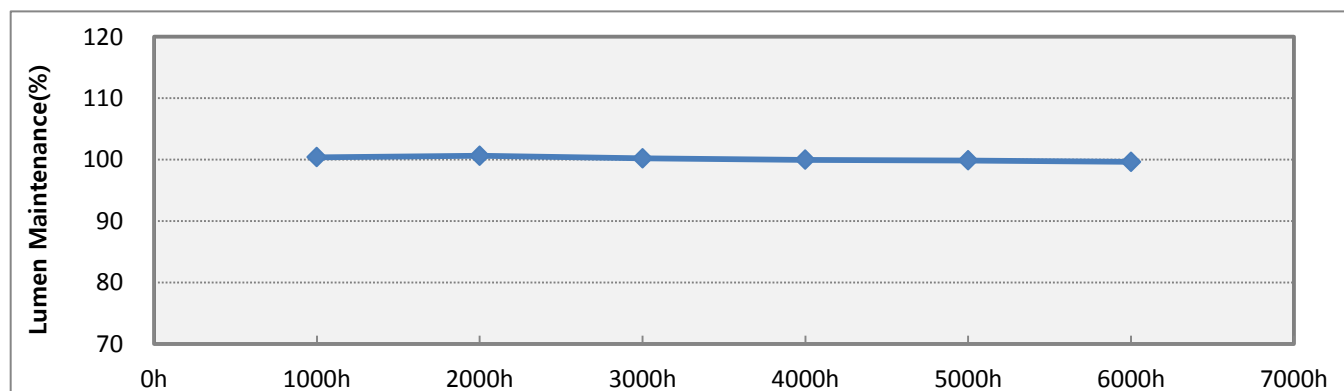
Seoul Semiconducrr maintain a tolerance of $\pm 3.04 \%$ at 95 % confidence level ($k = 2$)

Chromaticity Shift Over the Measurement Time

See the table of each data set

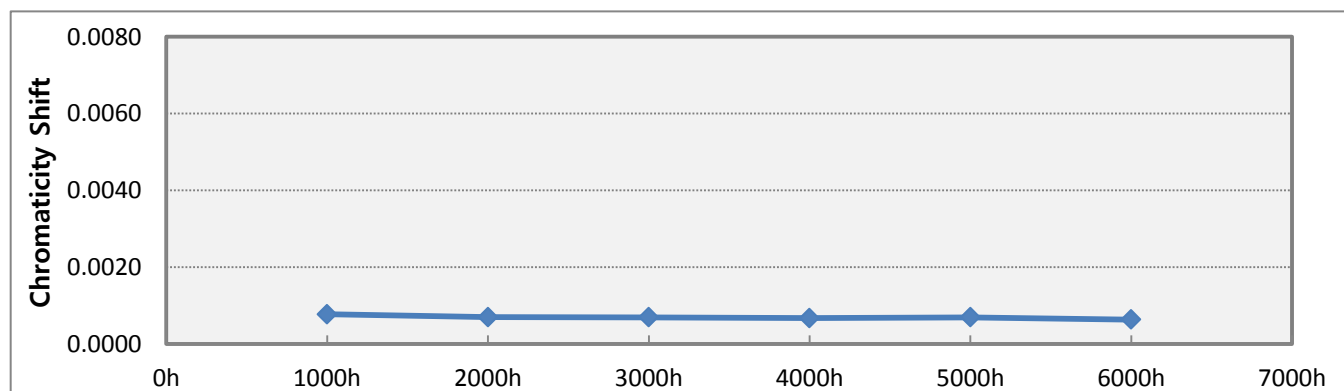
3. 55°C Data Set

No.	Initial Characteristics			Lumen Maintenance								
	Vf (V)	Flux (lm)	CCT (K)	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h			
01	9.12	438.32	2777	99.9	99.5	98.9	98.3	98.9	98.7			
02	8.99	453.47	2819	100.3	100.6	100.1	99.9	99.6	99.4			
03	9.23	447.02	2761	100.9	101.0	100.7	100.5	100.5	100.3			
04	9.13	448.40	2826	101.0	101.5	100.8	100.6	100.3	100.1			
05	9.21	437.83	2840	100.8	100.7	100.4	99.9	100.4	100.3			
06	9.00	455.52	2800	100.4	100.8	100.2	99.9	99.7	99.4			
07	9.22	448.24	2753	100.6	101.2	100.6	100.5	100.3	100.1			
08	9.16	445.51	2775	100.8	101.3	101.0	100.8	100.4	100.1			
09	9.12	439.73	2756	100.4	100.9	100.0	99.9	99.6	99.4			
10	9.02	433.76	2835	100.3	99.9	99.7	99.2	99.9	99.9			
11	9.13	451.14	2812	100.6	100.7	100.3	100.0	100.0	100.0			
12	9.12	451.46	2773	100.1	100.2	99.9	99.9	99.7	99.3			
13	9.17	448.40	2761	100.4	100.9	100.4	100.3	99.9	99.7			
14	9.20	449.02	2808	100.3	100.6	100.2	100.0	99.8	99.5			
15	9.15	449.80	2792	100.4	100.9	100.6	100.4	100.2	99.9			
16	9.23	439.61	2747	100.4	100.4	100.1	100.0	100.3	100.0			
17	9.22	449.70	2817	100.5	100.8	100.4	100.0	99.8	99.5			
18	9.20	446.78	2736	100.2	100.4	100.1	100.1	99.9	99.4			
19	9.11	452.42	2757	99.7	100.1	99.9	99.8	99.4	99.2			
20	9.22	438.64	2801	100.9	101.2	100.8	100.5	100.2	100.0			
21	9.16	432.61	2755	99.8	100.0	99.8	99.1	100.0	99.6			
22	9.32	454.27	2737	100.2	100.4	100.3	100.1	99.7	99.6			
23	9.08	460.47	2761	99.8	100.3	99.8	99.5	99.2	99.2			
24	9.05	457.34	2816	100.3	100.6	100.1	100.1	99.6	99.2			
25	9.11	433.37	2750	100.5	100.8	99.8	99.9	99.7	99.3			
Ave.	9.15	446.51	2783	100.4	100.6	100.2	100.0	99.9	99.6			
Med.	9.15	448.40	2775	100.4	100.7	100.2	100.0	99.9	99.6			
Min.	8.99	432.61	2736	99.7	99.5	98.9	98.3	98.9	98.7			
Max.	9.32	460.47	2840	101.0	101.5	101.0	100.8	100.5	100.3			
σ	0.08	7.77	32	0.4	0.5	0.4	0.5	0.4	0.4			



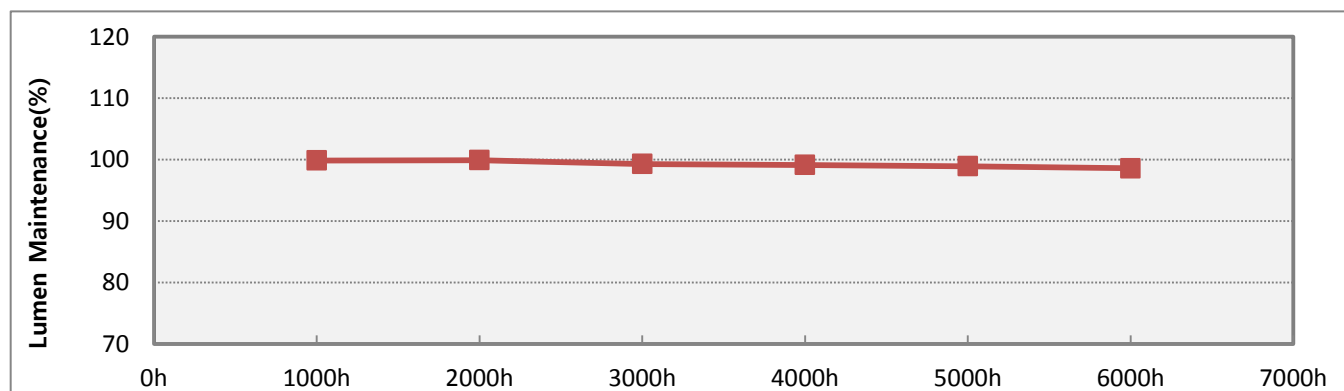
3. 55°C Data Set

No.	Initial Characteristics			Chromaticity Shift du'v'								
	u'	v'	CRI	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h			
01	0.2596	0.5238	82	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007			
02	0.2578	0.5231	82	0.0007	0.0006	0.0006	0.0005	0.0005	0.0005			
03	0.2602	0.5241	81	0.0006	0.0006	0.0006	0.0005	0.0006	0.0005			
04	0.2578	0.5220	81	0.0008	0.0007	0.0007	0.0007	0.0008	0.0007			
05	0.2574	0.5208	81	0.0006	0.0006	0.0006	0.0006	0.0007	0.0006			
06	0.2587	0.5229	82	0.0007	0.0006	0.0006	0.0006	0.0005	0.0006			
07	0.2605	0.5247	81	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006			
08	0.2598	0.5232	81	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006			
09	0.2605	0.5244	81	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006			
10	0.2574	0.5219	82	0.0007	0.0006	0.0006	0.0004	0.0005	0.0004			
11	0.2585	0.5212	81	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006			
12	0.2599	0.5232	81	0.0008	0.0008	0.0007	0.0007	0.0007	0.0006			
13	0.2602	0.5245	81	0.0008	0.0007	0.0007	0.0007	0.0008	0.0006			
14	0.2587	0.5215	81	0.0008	0.0008	0.0007	0.0007	0.0008	0.0007			
15	0.2591	0.5226	81	0.0008	0.0007	0.0007	0.0007	0.0008	0.0007			
16	0.2609	0.5242	81	0.0008	0.0008	0.0008	0.0007	0.0008	0.0007			
17	0.2583	0.5215	81	0.0008	0.0007	0.0008	0.0009	0.0009	0.0008			
18	0.2613	0.5249	81	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007			
19	0.2603	0.5249	81	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006			
20	0.2589	0.5220	81	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007			
21	0.2605	0.5241	81	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007			
22	0.2612	0.5248	81	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007			
23	0.2600	0.5252	82	0.0008	0.0007	0.0007	0.0006	0.0006	0.0006			
24	0.2579	0.5235	82	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006			
25	0.2608	0.5240	81	0.0009	0.0008	0.0008	0.0007	0.0008	0.0007			
Ave.	0.2595	0.5233	81	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006			
Med.	0.2598	0.5235	81	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006			
Min.	0.2574	0.5208	81	0.0006	0.0006	0.0006	0.0004	0.0005	0.0004			
Max.	0.2613	0.5252	82	0.0009	0.0008	0.0008	0.0009	0.0009	0.0008			
σ	0.0012	0.0013	0.4	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			



4. 85°C Data Set

No.	Initial Characteristics			Lumen Maintenance								
	Vf (V)	Flux (lm)	CCT (K)	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h			
01	9.00	436.99	2848	98.1	98.1	97.6	97.1	96.7	96.8			
02	9.25	450.63	2795	100.2	100.4	99.7	99.4	98.9	98.6			
03	9.17	454.25	2792	99.8	99.8	99.2	99.2	99.0	98.3			
04	9.17	450.67	2743	100.4	100.6	99.8	99.8	99.4	98.9			
05	8.99	433.07	2826	100.3	100.2	99.2	99.5	99.2	98.5			
06	8.98	443.23	2818	99.0	99.0	98.6	98.4	97.9	98.0			
07	9.22	447.01	2786	99.9	100.1	99.6	99.6	99.2	99.0			
08	9.13	458.42	2793	100.1	99.8	99.4	99.3	99.0	98.4			
09	9.17	451.09	2780	100.5	100.8	100.1	99.9	99.8	99.4			
10	9.14	437.65	2767	98.7	98.4	98.6	98.1	97.5	98.2			
11	9.16	452.13	2797	100.2	100.2	99.8	99.7	99.3	99.0			
12	8.99	454.66	2756	99.7	100.0	99.1	99.2	98.9	98.3			
13	9.15	450.38	2829	100.4	100.7	100.3	100.0	99.6	99.3			
14	9.15	435.83	2842	100.7	100.5	99.5	99.7	99.5	98.8			
15	9.16	431.69	2749	99.4	99.4	98.8	98.4	98.9	98.6			
16	9.10	459.49	2736	98.3	98.2	97.5	97.4	97.2	96.9			
17	9.19	452.03	2760	100.1	100.2	99.4	99.6	99.1	99.0			
18	9.13	446.34	2778	100.3	100.5	99.7	99.8	99.5	99.0			
19	9.23	441.08	2756	100.1	99.8	99.4	99.0	99.2	99.0			
20	9.18	452.42	2730	100.0	100.1	99.6	99.3	99.2	98.8			
21	9.00	456.49	2800	99.8	100.2	99.2	98.9	98.8	98.2			
22	9.16	439.65	2778	100.1	100.2	99.4	99.2	99.1	98.6			
23	9.16	432.10	2755	99.8	99.6	99.3	98.8	99.4	99.1			
24	9.12	453.73	2802	100.1	100.5	99.6	99.8	99.6	99.2			
25	9.11	451.03	2777	100.3	100.3	99.8	99.4	99.2	99.0			
Ave.	9.13	446.88	2784	99.9	99.9	99.3	99.1	98.9	98.6			
Med.	9.15	450.63	2780	100.1	100.2	99.4	99.3	99.2	98.8			
Min.	8.98	431.69	2730	98.1	98.1	97.5	97.1	96.7	96.8			
Max.	9.25	459.49	2848	100.7	100.8	100.3	100.0	99.8	99.4			
σ	0.08	8.54	32	0.7	0.8	0.7	0.7	0.8	0.6			



4. 85°C Data Set

No.	Initial Characteristics			Chromaticity Shift du'v'								
	u'	v'	CRI	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h			
01	0.2570	0.5209	82	0.0011	0.0010	0.0010	0.0010	0.0010	0.0010			
02	0.2590	0.5226	81	0.0008	0.0008	0.0008	0.0009	0.0008	0.0008			
03	0.2592	0.5225	81	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009			
04	0.2609	0.5250	81	0.0009	0.0009	0.0009	0.0010	0.0009	0.0009			
05	0.2577	0.5222	82	0.0009	0.0009	0.0009	0.0009	0.0008	0.0009			
06	0.2581	0.5223	82	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009			
07	0.2595	0.5223	81	0.0010	0.0010	0.0009	0.0010	0.0009	0.0010			
08	0.2589	0.5239	82	0.0009	0.0009	0.0009	0.0008	0.0009	0.0009			
09	0.2597	0.5226	81	0.0010	0.0010	0.0009	0.0010	0.0009	0.0010			
10	0.2602	0.5230	81	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010			
11	0.2591	0.5221	81	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009			
12	0.2603	0.5251	82	0.0009	0.0008	0.0009	0.0008	0.0008	0.0009			
13	0.2579	0.5210	81	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010			
14	0.2573	0.5208	81	0.0009	0.0009	0.0009	0.0009	0.0009	0.0010			
15	0.2607	0.5246	81	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011			
16	0.2610	0.5263	81	0.0013	0.0013	0.0013	0.0013	0.0013	0.0012			
17	0.2603	0.5241	81	0.0010	0.0010	0.0010	0.0011	0.0011	0.0011			
18	0.2595	0.5239	81	0.0013	0.0011	0.0011	0.0011	0.0010	0.0011			
19	0.2605	0.5239	81	0.0009	0.0010	0.0009	0.0009	0.0009	0.0009			
20	0.2615	0.5250	81	0.0013	0.0013	0.0011	0.0012	0.0012	0.0012			
21	0.2587	0.5230	82	0.0010	0.0009	0.0010	0.0009	0.0009	0.0010			
22	0.2596	0.5234	81	0.0013	0.0012	0.0012	0.0012	0.0011	0.0012			
23	0.2605	0.5242	81	0.0009	0.0009	0.0009	0.0008	0.0008	0.0009			
24	0.2589	0.5219	81	0.0012	0.0011	0.0011	0.0011	0.0010	0.0011			
25	0.2596	0.5237	81	0.0009	0.0009	0.0009	0.0009	0.0009	0.0010			
Ave.	0.2594	0.5232	81	0.0010	0.0010	0.0010	0.0010	0.0009	0.0010			
Med.	0.2595	0.5230	81	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010			
Min.	0.2570	0.5208	81	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008			
Max.	0.2615	0.5263	82	0.0013	0.0013	0.0013	0.0013	0.0013	0.0012			
σ	0.0012	0.0014	0.5	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001			

