

IES LM-80 Test Report

Report Issue Date : May 02, 2018 **Report Number :** I-170321-025-K-02
Testing Start Date : March 27, 2017 **Testing Completion Date :** February 02, 2018
Revision Number : 02 **Test Duration :** 7 000 h

Manufacturer Information :

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

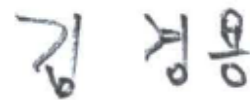
Description of Test Samples :

Classification : LED Package
PKG Name : MJT5050
Part Number : SAWxL60A-E1
Drive Current : 225 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.

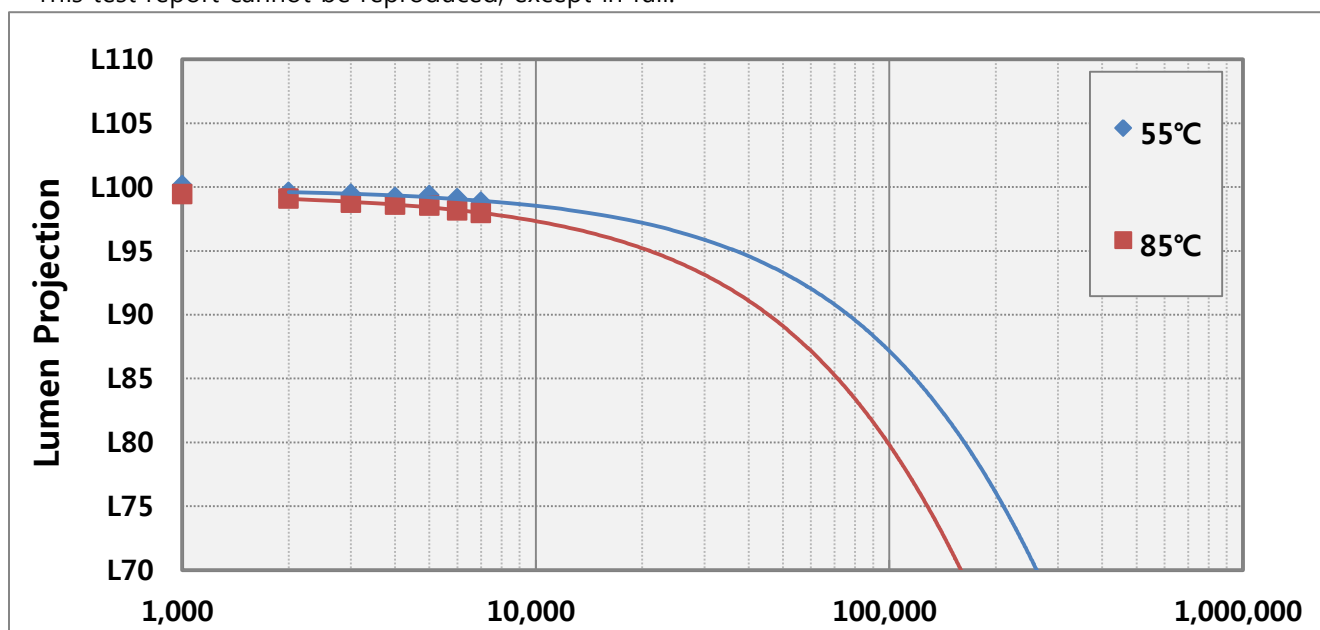
Seoul Semiconductor Testing Laboratory

97-11, Sandan-ro 163, Danwon-gu, Ansan, Gyeonggi-do, Korea 15429, E-mail: LM80@seoulsemicon.com

1. Test Summary

Items	Nominal Case Temperature		
	55 °C	85 °C	
Number of LED tested	20	20	
Drive and Measurement Current	225 mA	225 mA	
Test Duration	7 000 h	7 000 h	
Actual Case Temperature	≥53.9 °C	≥84.2 °C	
Actual Ambient Temperature	≥50.9 °C	≥80.0 °C	
Air Flow Velocity	≤0.64 m/s	≤0.38 m/s	
Averaged Initial Luminous Flux	632.5 lm	644.7 lm	
Initial Nominal CCT	3000 K	3000 K	
Average Initial CRI	73	72	
Total Input Power	4.1 W	4.1 W	
Average Current Density per die (mA/mm ²)	211	211	
Average Power Density per die (W/mm ²)	0.03	0.03	
Minimum Spacing from die edge to die edge	0.3 mm	0.3 mm	
Average Lumen Maintenance	98.8 %	98.0 %	
Average Chromaticity Shift	0.000 6	0.000 6	
α	1.363E-06	2.207E-06	
B	0.999	0.995	
TM-21 Projection L ₇₀	>42000	>42000	
TM-21 Projection L ₈₀	>42000	>42000	
TM-21 Projection L ₉₀	>42000	>42000	

※ 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

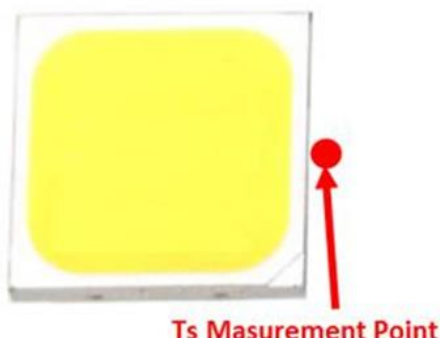
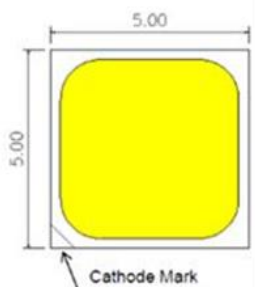

Ambient temperature : $\geq -5^{\circ}\text{C}$ of Nominal T_A

(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

Case Temperature Measurement Point	Package Dimension
 <p>Ts Masurement Point</p>	<div> <div> <p>< Top View ></p>  <p>5.00</p> <p>5.00</p> <p>Cathode Mark</p> </div> <div> <p>< Side view ></p>  <p>0.70</p> </div> </div>

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

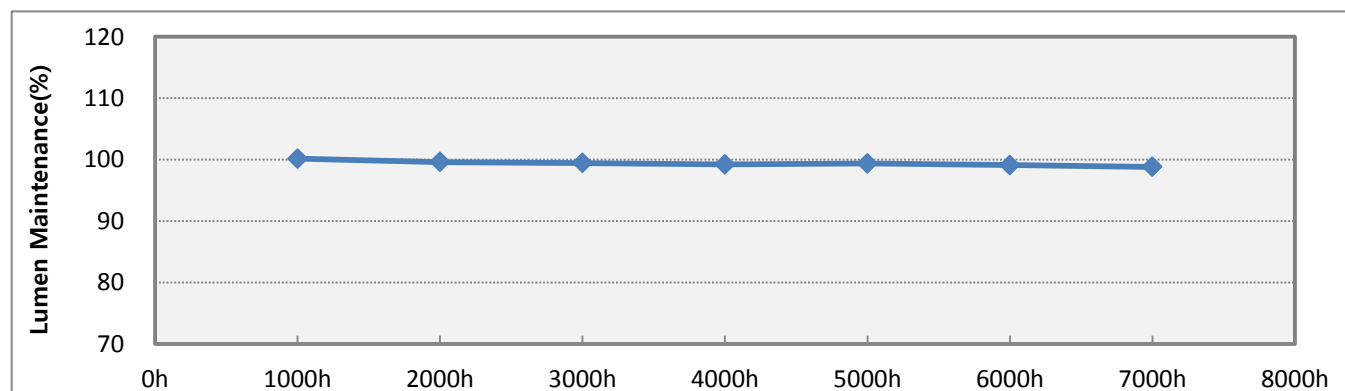
Seoul Semiconducrt maintain a tolerance of $\pm 3.04 \%$ at 95 % confidence level ($k = 2$)

Chromaticity Shift Over the Measurement Time

See the table of each data set

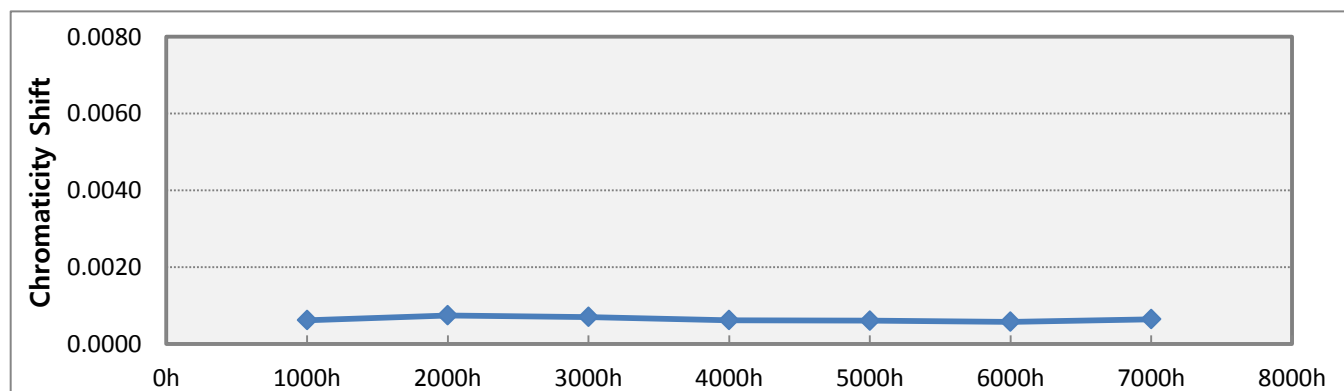
3. 55°C Data Set

No.	Initial Characteristics			Lumen Maintenance								
	Vf (V)	Flux (lm)	CCT (K)	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h		
01	17.96	627.65	3095	99.9	99.5	99.9	99.6	99.7	99.4	99.0		
02	17.97	654.57	3114	100.2	99.4	99.1	98.6	98.9	98.7	98.5		
03	18.05	653.07	3119	99.9	99.5	99.3	99.1	99.2	98.9	99.0		
04	17.97	647.86	3118	99.8	99.2	98.7	98.8	99.0	98.5	98.6		
05	17.94	627.77	3107	100.3	99.6	99.5	99.3	99.8	99.3	98.9		
06	18.17	639.36	3110	100.2	99.0	99.0	98.8	99.2	98.7	98.3		
07	17.96	649.98	3090	100.8	99.9	99.7	99.3	99.7	99.6	99.6		
08	17.94	651.52	3127	100.4	99.7	100.0	99.9	100.0	99.8	99.9		
09	18.02	656.95	3107	99.5	99.1	99.2	98.8	99.0	98.8	98.6		
10	17.89	644.64	3130	100.3	100.0	99.5	99.4	99.4	99.6	99.2		
11	17.96	629.92	3071	100.5	99.6	100.0	99.5	99.3	99.5	97.9		
12	18.09	597.84	3136	100.0	100.1	99.9	99.4	99.5	98.3	97.4		
13	18.19	621.48	3165	100.6	100.0	99.6	99.5	99.5	99.2	99.1		
14	18.10	629.28	2883	100.0	99.4	99.3	98.8	99.3	99.1	99.0		
15	18.21	624.94	2873	100.5	99.9	99.6	99.3	99.5	99.4	99.2		
16	18.12	601.64	2883	100.4	99.7	99.2	99.3	99.2	99.0	98.9		
17	18.07	630.00	2890	99.6	99.2	99.3	99.0	99.0	98.9	99.0		
18	18.17	629.01	2893	99.9	99.5	99.7	99.1	99.5	99.3	99.5		
19	18.11	629.24	2888	100.4	100.0	99.2	99.3	99.1	99.3	98.8		
20	18.18	604.15	2875	99.7	99.6	99.8	99.6	99.5	99.2	98.2		
Ave.	18.05	632.54	3034	100.1	99.6	99.5	99.2	99.4	99.1	98.8		
Med.	18.06	629.60	3101	100.2	99.6	99.5	99.3	99.3	99.2	98.9		
Min.	17.89	597.84	2873	99.5	99.0	98.7	98.6	98.9	98.3	97.4		
Max.	18.21	656.95	3165	100.8	100.1	100.0	99.9	100.0	99.8	99.9		
σ	0.10	17.52	115	0.4	0.3	0.4	0.3	0.3	0.4	0.6		



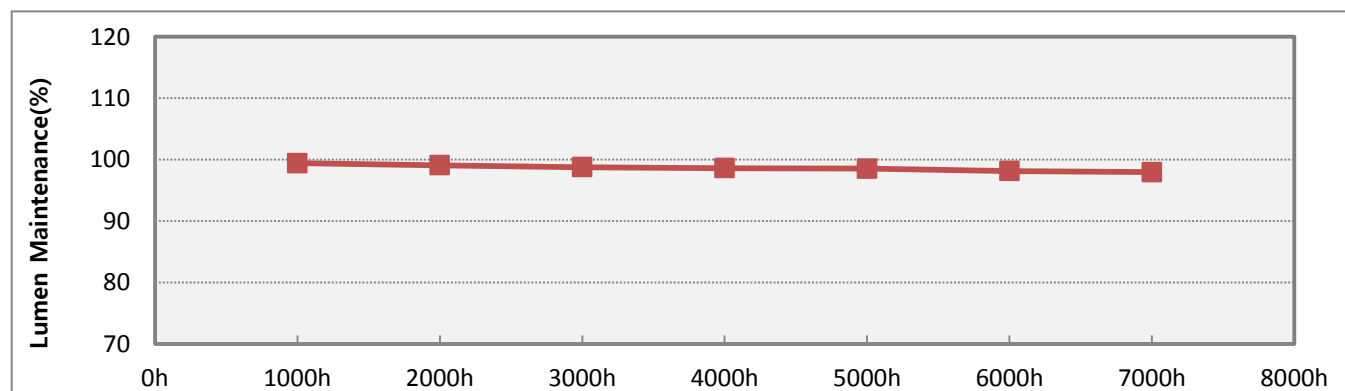
3. 55°C Data Set

No.	Initial Characteristics			Chromaticity Shift du'v'								
	u'	v'	CRI	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h		
01	0.2478	0.5179	72	0.0008	0.0009	0.0008	0.0006	0.0006	0.0006	0.0005		
02	0.2471	0.5178	72	0.0005	0.0006	0.0006	0.0006	0.0005	0.0006	0.0006		
03	0.2468	0.5179	72	0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007		
04	0.2473	0.5163	72	0.0007	0.0007	0.0008	0.0006	0.0006	0.0005	0.0005		
05	0.2474	0.5176	72	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0008		
06	0.2476	0.5164	72	0.0005	0.0007	0.0007	0.0006	0.0006	0.0006	0.0007		
07	0.2481	0.5175	72	0.0005	0.0007	0.0007	0.0005	0.0005	0.0005	0.0005		
08	0.2467	0.5174	72	0.0005	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007		
09	0.2474	0.5173	72	0.0008	0.0009	0.0008	0.0007	0.0006	0.0005	0.0006		
10	0.2465	0.5175	72	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006	0.0006		
11	0.2485	0.5186	71	0.0006	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006		
12	0.2503	0.5032	75	0.0004	0.0007	0.0007	0.0006	0.0006	0.0007	0.0010		
13	0.2499	0.5012	75	0.0006	0.0008	0.0007	0.0006	0.0006	0.0005	0.0006		
14	0.2568	0.5154	73	0.0005	0.0007	0.0007	0.0006	0.0006	0.0005	0.0006		
15	0.2573	0.5148	73	0.0006	0.0008	0.0007	0.0006	0.0006	0.0004	0.0006		
16	0.2571	0.5142	73	0.0005	0.0007	0.0007	0.0006	0.0006	0.0005	0.0006		
17	0.2567	0.5149	73	0.0009	0.0010	0.0009	0.0008	0.0008	0.0006	0.0006		
18	0.2568	0.5137	73	0.0007	0.0008	0.0006	0.0006	0.0006	0.0006	0.0007		
19	0.2569	0.5143	73	0.0006	0.0008	0.0008	0.0006	0.0006	0.0005	0.0006		
20	0.2573	0.5148	73	0.0006	0.0009	0.0008	0.0006	0.0006	0.0005	0.0007		
Ave.	0.2510	0.5149	73	0.0006	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006		
Med.	0.2483	0.5164	72	0.0006	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006		
Min.	0.2465	0.5012	71	0.0004	0.0006	0.0006	0.0005	0.0005	0.0004	0.0005		
Max.	0.2573	0.5186	75	0.0009	0.0010	0.0009	0.0008	0.0008	0.0007	0.0010		
σ	0.0046	0.0046	1.1	0.0001	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	7000 h		
01	18.10	629.28	3098	98.9	98.6	98.5	98.3	98.3	97.9	97.6		
02	17.97	651.75	3102	99.3	98.8	98.7	98.7	98.2	97.8	98.0		
03	17.88	649.78	3087	100.3	99.6	98.9	99.0	99.0	98.1	98.5		
04	17.95	652.68	3085	99.7	99.2	99.3	98.7	98.7	98.4	98.5		
05	17.93	628.92	3104	98.6	98.4	98.2	98.1	97.8	97.5	97.2		
06	17.91	638.11	3096	99.3	99.0	98.7	98.4	98.6	98.1	97.5		
07	17.95	658.04	3098	99.1	98.1	97.8	97.5	97.7	97.3	97.2		
08	18.06	653.33	3104	99.8	98.7	98.5	98.7	98.5	98.3	97.9		
09	17.92	660.39	3108	99.5	99.0	98.7	98.4	98.6	98.0	98.3		
10	17.95	644.17	3085	99.3	98.9	98.5	98.5	98.5	98.3	97.9		
11	17.87	632.51	3113	99.8	99.6	99.5	99.0	98.6	98.6	97.5		
12	17.95	650.47	3108	99.4	99.4	98.6	98.4	98.2	97.9	97.5		
13	17.90	653.57	3095	99.7	99.1	98.8	98.4	98.5	98.0	98.2		
14	17.90	650.59	3087	99.4	99.2	98.8	98.8	98.4	98.2	98.5		
15	17.89	623.04	3121	99.7	99.4	99.0	98.9	98.8	98.6	98.6		
16	18.07	638.92	3094	99.3	99.9	99.1	99.0	99.2	98.2	97.5		
17	17.94	657.14	3101	99.4	98.9	98.7	98.6	98.7	98.6	98.5		
18	17.94	650.63	3103	99.2	98.6	98.3	98.5	98.6	98.1	98.3		
19	17.96	638.95	3096	99.7	99.4	99.0	98.8	98.7	98.3	98.3		
20	18.09	632.04	3099	99.2	99.9	99.7	99.6	99.1	98.9	97.7		
Ave.	17.96	644.72	3099	99.4	99.1	98.8	98.6	98.5	98.2	98.0		
Med.	17.95	650.13	3098	99.4	99.1	98.7	98.6	98.6	98.2	98.0		
Min.	17.87	623.04	3085	98.6	98.1	97.8	97.5	97.7	97.3	97.2		
Max.	18.10	660.39	3121	100.3	99.9	99.7	99.6	99.2	98.9	98.6		
σ	0.07	11.12	9	0.4	0.5	0.4	0.4	0.4	0.4	0.5		



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	7000 h		
01	0.2477	0.5176	72	0.0009	0.0008	0.0008	0.0007	0.0006	0.0006	0.0006		
02	0.2474	0.5181	72	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0010		
03	0.2478	0.5187	72	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005		
04	0.2479	0.5190	72	0.0007	0.0005	0.0006	0.0005	0.0005	0.0005	0.0006		
05	0.2476	0.5171	72	0.0010	0.0009	0.0008	0.0008	0.0008	0.0008	0.0008		
06	0.2478	0.5175	72	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006		
07	0.2475	0.5186	72	0.0009	0.0008	0.0008	0.0009	0.0007	0.0007	0.0007		
08	0.2473	0.5183	72	0.0007	0.0007	0.0007	0.0006	0.0006	0.0007	0.0006		
09	0.2473	0.5178	72	0.0008	0.0007	0.0006	0.0007	0.0006	0.0006	0.0006		
10	0.2479	0.5189	72	0.0008	0.0007	0.0006	0.0005	0.0005	0.0005	0.0004		
11	0.2470	0.5181	72	0.0011	0.0009	0.0008	0.0007	0.0007	0.0006	0.0006		
12	0.2473	0.5178	72	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005	0.0005		
13	0.2477	0.5182	72	0.0007	0.0005	0.0006	0.0005	0.0004	0.0005	0.0005		
14	0.2480	0.5182	72	0.0007	0.0006	0.0006	0.0006	0.0005	0.0005	0.0006		
15	0.2470	0.5172	72	0.0007	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007		
16	0.2476	0.5185	72	0.0007	0.0007	0.0007	0.0006	0.0006	0.0007	0.0006		
17	0.2476	0.5178	72	0.0007	0.0006	0.0006	0.0006	0.0005	0.0006	0.0005		
18	0.2478	0.5167	72	0.0008	0.0007	0.0007	0.0006	0.0005	0.0006	0.0006		
19	0.2479	0.5172	72	0.0007	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007		
20	0.2473	0.5192	72	0.0011	0.0010	0.0009	0.0008	0.0008	0.0008	0.0008		
Ave.	0.2476	0.5180	72	0.0008	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006		
Med.	0.2476	0.5181	72	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006		
Min.	0.2470	0.5167	72	0.0006	0.0005	0.0006	0.0005	0.0004	0.0005	0.0004		
Max.	0.2480	0.5192	72	0.0011	0.0010	0.0009	0.0009	0.0009	0.0010	0.0010		
σ	0.0003	0.0007	0.1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		

