

Test Location:	[√]	1. Standard-Tech Building, No.6 Guanhong Road, Guangzhou Science City, Guangzhou 510663, China		
	[]	3. Other:		
Project No.:	GZE150901-A		Test by:	Johnson Sun
Applicant:	[REDACTED]		Model:	3528
Case Temp.:	55°C	70°C	85°C	Rated Current:
	20mA			
Test Date:	2015-10-08 TO 2016-06-15			
Standard	IESNA LM-80-2015 (Refer to QD31)			

Test & Report By:	<i>Johnson Sun</i>	Review By:	<i>Tommy Liang</i>
Date:	July.12, 2016	Date	July.12, 2016



1. Standards used: IES LM-80-08 Approved Method for Measuring Lumen Maintenance of LED Light Sources.

2. LED packages are driven at constant current for both life test and photometric test.

3. Ambient conditions, airflow, relative humidity

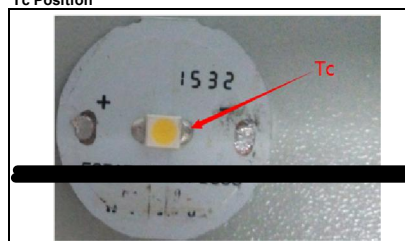
LED's are operated on controlled thermal plates in an environment that complies with the requirements given in Section 4.4 of IES LM80-2008. Case temperature (Ts): controlled within -2°C, Surrounding air temp: controlled to within -5°C of Ts, Humidity: < 65 RH. Airflow shall be minimized.

4. The input current shall be monitored and regulated to within +/-3% of the rated rms value during life testing.

5. Test Results Summary

Items	Case Temperature of LM-80-2008		
	55°C	70°C	85°C
Total Test Time (hours)	6000	6000	6000
Average Luminous Flux (lm)	7.68	7.61	7.63
Average Voltage (V)	2.972	2.951	2.967
Average Color Temperature (K)	3000	3000	3000
Test Current (mA)	20	20	20
Case Temperature [Ts] (°C)	55.9	71.1	85.3
Surrounding Air Temperature (°C)	55.4	70.4	85.1
Average Lumen Maintenance at 6000 h (%)	98.22%	97.49%	97.16%
Average Chromaticity Shift at 6000 h	0.0009	0.0018	0.0024

Tc Position



6. Equipment List

Equipment ID	Equipment Name	Calibration date	Next Calibration date
ST-R-328	0.5m Integrating sphere	2015-7-1	2016-7-1
ST-R-333	Power Meter	2015-7-1	2016-7-1
ST-R-335	DC power source	2015-7-1	2016-7-1

7. Uncertainty of Measurement

Uncertainty of Photometric Measurement:

Uncertainty of Life Test: 0.28%, k=2

Data set 1, 55°C, 20mA

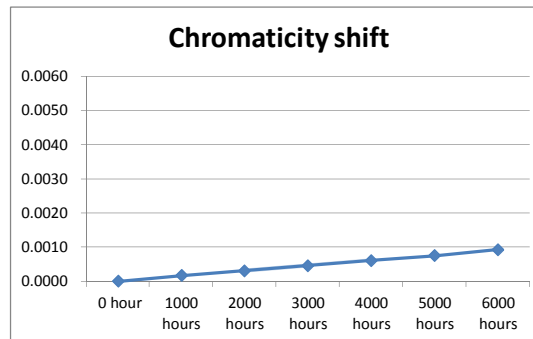
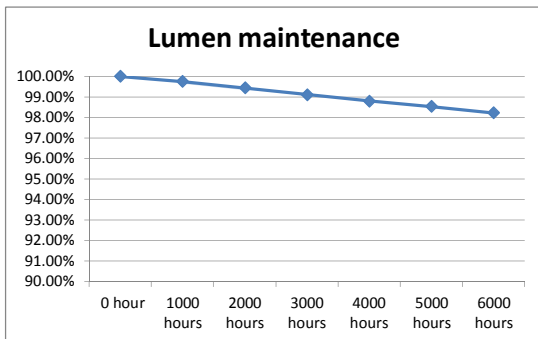
Model 3528
Actual Case Temperature(TS): 55.9 °C
Actual Oven Temperature(TA): 55.4 °C
Life Test Drive Current: 20 mA
Measurement Current: 20.07 mA
Ambien: 30 °C
Humidity: 60%RH

Lumen maintenance

	Sample no.	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#	13#	14#	15#	16#	17#	18#	19#	20#	Avg.	Min.	Max.	Med
0 hour	Vf (V)	2.975	2.963	2.964	2.939	2.981	2.979	2.978	2.968	2.967	2.964	2.981	2.982	2.981	2.978	2.984	2.962	2.976	2.969	2.983	2.979				
	Im	7.64	7.62	7.62	7.54	7.75	7.72	7.72	7.63	7.65	7.63	7.72	7.72	7.71	7.64	7.76	7.63	7.72	7.65	7.75	7.71				
1000 hours	Im	7.63	7.60	7.61	7.52	7.72	7.71	7.71	7.59	7.63	7.62	7.71	7.70	7.70	7.63	7.74	7.61	7.69	7.59	7.74	7.70	99.75%	99.22%	99.87%	99.80%
	Maintenance	99.87%	99.74%	99.87%	99.73%	99.61%	99.87%	99.87%	99.48%	99.74%	99.87%	99.87%	99.74%	99.87%	99.87%	99.74%	99.74%	99.61%	99.22%	99.87%	99.87%				
2000 hours	Im	7.60	7.59	7.59	7.50	7.69	7.69	7.68	7.57	7.60	7.58	7.69	7.68	7.66	7.62	7.71	7.60	7.68	7.55	7.73	7.65	99.43%	98.69%	99.74%	99.47%
	Maintenance	99.48%	99.61%	99.61%	99.47%	99.23%	99.61%	99.48%	99.21%	99.35%	99.34%	99.61%	99.48%	99.35%	99.74%	99.36%	99.61%	99.48%	98.69%	99.74%	99.22%				
3000 hours	Im	7.58	7.57	7.56	7.48	7.65	7.66	7.65	7.55	7.56	7.56	7.66	7.65	7.61	7.61	7.70	7.61	7.65	7.52	7.72	7.62	99.11%	98.30%	99.74%	99.15%
	Maintenance	99.21%	99.34%	99.21%	99.20%	98.71%	99.22%	99.09%	98.95%	98.82%	99.08%	99.22%	99.09%	98.70%	99.61%	99.23%	99.74%	99.09%	98.30%	99.61%	98.83%				
4000 hours	Im	7.56	7.55	7.52	7.46	7.63	7.61	7.62	7.52	7.54	7.53	7.62	7.59	7.68	7.59	7.68	7.60	7.62	7.50	7.71	7.59	98.79%	98.04%	99.61%	98.69%
	Maintenance	98.95%	99.08%	98.69%	98.94%	98.45%	98.58%	98.70%	98.56%	98.56%	98.69%	98.83%	98.70%	98.44%	99.35%	98.97%	99.61%	98.70%	98.04%	99.48%	98.44%				
5000 hours	Im	7.55	7.52	7.50	7.43	7.60	7.60	7.61	7.51	7.52	7.51	7.61	7.6	7.56	7.65	7.59	7.65	7.58	7.48	7.70	7.56	98.53%	97.78%	99.48%	98.44%
	Maintenance	98.82%	98.69%	98.43%	98.54%	98.06%	98.45%	98.58%	98.43%	98.30%	98.43%	98.58%	98.45%	98.05%	99.35%	98.58%	99.48%	98.19%	97.78%	99.35%	98.05%				
6000 hours	Im	7.53	7.50	7.49	7.41	7.58	7.57	7.57	7.48	7.49	7.48	7.58	7.55	7.53	7.58	7.62	7.58	7.57	7.46	7.69	7.53	98.22%	97.52%	99.34%	98.06%
	Maintenance	98.56%	98.43%	98.29%	98.28%	97.81%	98.06%	98.06%	98.03%	97.91%	98.03%	98.19%	97.80%	97.67%	99.21%	98.20%	99.34%	98.06%	97.52%	99.23%	97.67%				

Chromaticity shift

	Sample no.	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#	13#	14#	15#	16#	17#	18#	19#	20#	Avg.	Min.	Max.	Med
0 hour	U'	0.2496	0.2500	0.2495	0.2486	0.2501	0.2497	0.2502	0.2498	0.2503	0.2494	0.2498	0.2503	0.2489	0.2497	0.2500	0.2493	0.2495	0.2500	0.2489	0.2497	0.2497	0.2486	0.2503	0.2497
	V'	0.5201	0.5182	0.5193	0.5178	0.5195	0.5183	0.5206	0.5195	0.5186	0.5184	0.5197	0.5204	0.5184	0.5191	0.5187	0.5202	0.5184	0.5197	0.5192	0.5186	0.5191	0.5178	0.5206	0.5192
	Chromaticity shift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1000 hours	Chromaticity shift	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0001
2000 hours	Chromaticity shift	0.0003	0.0003	0.0004	0.0004	0.0002	0.0004	0.0003	0.0004	0.0003	0.0003	0.0002	0.0004	0.0003	0.0002	0.0003	0.0004	0.0004	0.0004	0.0002	0.0003	0.0003	0.0002	0.0004	0.0003
3000 hours	Chromaticity shift	0.0004	0.0004	0.0005	0.0006	0.0004	0.0005	0.0004	0.0005	0.0004	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0004	0.0005	0.0005	0.0004	0.0004	0.0005	0.0004	0.0006	0.0004
4000 hours	Chromaticity shift	0.0006	0.0006	0.0006	0.0007	0.0005	0.0006	0.0006	0.0006	0.0006	0.0007	0.0006	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0007	0.0006
5000 hours	Chromaticity shift	0.0007	0.0008	0.0008	0.0009	0.0006	0.0008	0.0007	0.0009	0.0008	0.0008	0.0007	0.0006	0.0008	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007	0.0008	0.0006	0.0008
6000 hours	Chromaticity shift	0.0009	0.0010	0.0011	0.0010	0.0008	0.0009	0.0008	0.0010	0.0010	0.0009	0.0009	0.0009	0.0009	0.0008	0.0008	0.0010	0.0009	0.0010	0.0009	0.0009	0.0009	0.0008	0.0011	0.0009



Data set 2, 70°C, 20mA

Model 3528
Actual Case Temperature(TS): 71.1 °C
Actual Oven Temperature(TA): 70.4 °C

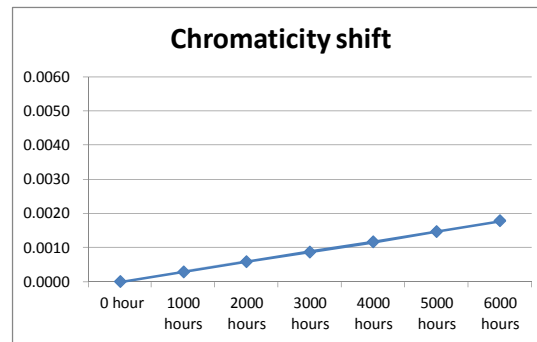
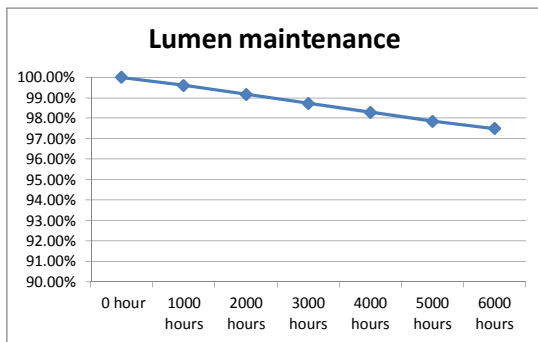
Life Test Drive Current: 20 mA
 Measurement Current: 20.12 mA
 Ambient: 30 °C
 Humidity: 60%RH

Lumen maintenance

	Sample no.	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#	13#	14#	15#	16#	17#	18#	19#	20#	Avg.	Min.	Max.	Med
0 hour	Vf (V)	2.959	2.952	2.961	2.976	2.974	2.982	2.963	2.968	2.954	2.957	2.951	2.962	2.955	2.956	2.974	2.963	2.954	2.957	2.982	2.955				
	Im	7.59	7.57	7.63	7.65	7.64	7.72	7.63	7.64	7.57	7.58	7.57	7.63	7.57	7.58	7.64	7.63	7.57	7.58	7.72	7.57				
1000 hours	Im	7.52	7.53	7.59	7.62	7.61	7.68	7.59	7.60	7.54	7.57	7.54	7.58	7.53	7.55	7.61	7.61	7.56	7.57	7.71	7.56	99.60%	99.08%	99.87%	99.60%
	Maintenance	99.08%	99.47%	99.48%	99.61%	99.61%	99.48%	99.48%	99.48%	99.60%	99.87%	99.60%	99.34%	99.47%	99.60%	99.61%	99.74%	99.87%	99.87%	99.87%	99.87%				
2000 hours	Im	7.50	7.48	7.55	7.57	7.58	7.63	7.56	7.57	7.51	7.53	7.51	7.53	7.51	7.52	7.59	7.58	7.54	7.56	7.69	7.51	99.17%	98.69%	99.74%	99.21%
	Maintenance	98.81%	98.81%	98.95%	98.95%	99.21%	98.83%	99.08%	99.08%	99.21%	99.34%	99.21%	98.69%	99.21%	99.35%	99.34%	99.60%	99.74%	99.61%	99.21%					
3000 hours	Im	7.45	7.45	7.51	7.53	7.54	7.58	7.51	7.53	7.47	7.49	7.47	7.49	7.48	7.48	7.57	7.56	7.53	7.54	7.67	7.48	98.72%	98.16%	99.47%	98.68%
	Maintenance	98.16%	98.41%	98.43%	98.43%	98.69%	98.19%	98.43%	98.56%	98.68%	98.81%	98.81%	98.17%	98.81%	99.08%	99.08%	99.47%	99.47%	99.47%	99.35%	98.81%				
4000 hours	Im	7.41	7.40	7.46	7.50	7.51	7.53	7.48	7.49	7.43	7.46	7.43	7.46	7.45	7.46	7.56	7.53	7.51	7.52	7.65	7.45	98.30%	97.54%	99.21%	98.22%
	Maintenance	97.63%	97.75%	97.77%	98.04%	98.30%	97.54%	98.03%	98.04%	98.15%	98.42%	98.15%	97.77%	98.41%	98.42%	98.95%	98.69%	99.21%	99.21%	99.09%	98.41%				
5000 hours	Im	7.39	7.37	7.41	7.47	7.47	7.49	7.45	7.45	7.39	7.42	7.39	7.41	7.42	7.41	7.56	7.49	7.49	7.50	7.62	7.41	97.85%	97.02%	98.95%	97.70%
	Maintenance	97.36%	97.36%	97.12%	97.65%	97.77%	97.02%	97.64%	97.51%	97.62%	97.89%	97.62%	97.12%	98.02%	97.76%	98.95%	98.17%	98.94%	98.94%	98.70%	97.89%				
6000 hours	Im	7.36	7.35	7.39	7.43	7.43	7.45	7.42	7.41	7.37	7.39	7.35	7.40	7.40	7.39	7.54	7.47	7.46	7.48	7.59	7.38	97.49%	96.50%	98.69%	97.30%
	Maintenance	96.97%	97.09%	96.85%	97.12%	97.25%	96.50%	97.25%	96.99%	97.36%	97.49%	97.09%	96.99%	97.75%	97.49%	98.69%	97.90%	98.55%	98.68%	98.32%	97.49%				

Chromaticity shift

	Sample no.	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#	13#	14#	15#	16#	17#	18#	19#	20#	Avg.	Min.	Max.	Med
0 hour	U'	0.2496	0.2489	0.2503	0.2491	0.2504	0.2503	0.2498	0.2493	0.2488	0.2485	0.2500	0.2503	0.2499	0.2495	0.2498	0.2502	0.2506	0.2489	0.2491	0.2502	0.2497	0.2485	0.2506	0.2498
	V'	0.5186	0.5181	0.5197	0.5205	0.5186	0.5179	0.5184	0.5192	0.5179	0.5193	0.5195	0.5196	0.5189	0.5201	0.5199	0.5200	0.5179	0.5182	0.5175	0.5195	0.5190	0.5175	0.5205	0.5191
	Chromaticity shift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1000 hours	Chromaticity shift	0.0002	0.0004	0.0003	0.0002	0.0003	0.0003	0.0002	0.0003	0.0003	0.0003	0.0002	0.0002	0.0003	0.0002	0.0004	0.0004	0.0002	0.0003	0.0004	0.0003	0.0003	0.0002	0.0004	0.0003
2000 hours	Chromaticity shift	0.0005	0.0007	0.0006	0.0006	0.0008	0.0006	0.0006	0.0005	0.0006	0.0006	0.0004	0.0004	0.0006	0.0005	0.0006	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0004	0.0008	0.0006
3000 hours	Chromaticity shift	0.0008	0.0010	0.0008	0.0008	0.0011	0.0008	0.0009	0.0008	0.0009	0.0008	0.0007	0.0007	0.0009	0.0008	0.0008	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009	0.0007	0.0011	0.0009
4000 hours	Chromaticity shift	0.0011	0.0013	0.0011	0.0011	0.0014	0.0012	0.0012	0.0011	0.0011	0.0012	0.0011	0.0011	0.0011	0.0011	0.0010	0.0012	0.0011	0.0013	0.0012	0.0011	0.0012	0.0010	0.0014	0.0011
5000 hours	Chromaticity shift	0.0014	0.0016	0.0014	0.0015	0.0018	0.0015	0.0015	0.0014	0.0013	0.0015	0.0017	0.0015	0.0013	0.0014	0.0013	0.0013	0.0014	0.0016	0.0015	0.0014	0.0015	0.0013	0.0018	0.0015
6000 hours	Chromaticity shift	0.0016	0.0019	0.0017	0.0018	0.0021	0.0018	0.0018	0.0016	0.0017	0.0019	0.0021	0.0017	0.0016	0.0018	0.0017	0.0016	0.0016	0.0018	0.0018	0.0017	0.0018	0.0016	0.0021	0.0017



Data set 3, 85°C, 20mA
 Model 3528
 Actual Case Temperature(TS): 85.3 °C
 Actual Oven Temperature(TA): 85.1 °C
 Life Test Drive Current: 20 mA
 Measurement Current: 20.25 mA
 Ambient: 30 °C

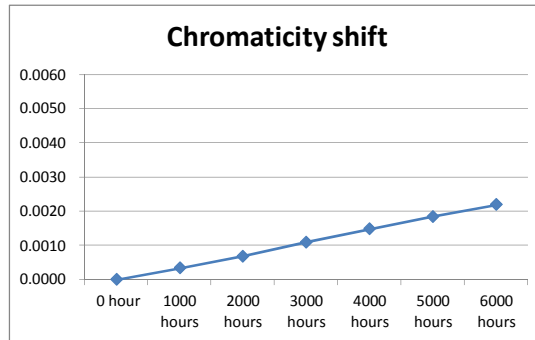
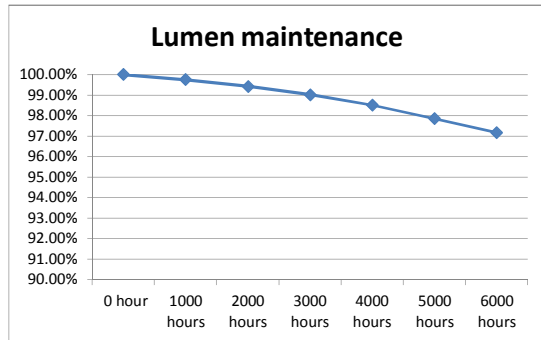
Humidity: 60%RH

Lumen maintenance

	Sample no.	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#	13#	14#	15#	16#	17#	18#	19#	20#	Avg.	Min.	Max.	Med
0 hour	Vf (V)	2.972	2.968	2.955	2.983	2.976	2.964	2.959	2.978	2.967	2.963	2.957	2.961	2.966	2.984	2.956	2.967	2.969	2.980	2.957	2.963				
	Im	7.64	7.63	7.58	7.72	7.65	7.63	7.59	7.65	7.63	7.62	7.58	7.62	7.63	7.73	7.58	7.63	7.64	7.72	7.58	7.63				
1000 hours	Im	7.58	7.60	7.54	7.69	7.64	7.59	7.58	7.64	7.62	7.58	7.57	7.61	7.62	7.72	7.57	7.62	7.63	7.71	7.57	7.62	99.75%	99.21%	99.87%	99.87%
	Maintenance	99.21%	99.61%	99.47%	99.61%	99.87%	99.48%	99.87%	99.87%	99.87%	99.48%	99.87%	99.87%	99.87%	99.87%	99.87%	99.87%	99.87%	99.87%	99.87%	99.87%				
2000 hours	Im	7.53	7.55	7.52	7.68	7.62	7.57	7.54	7.62	7.58	7.55	7.55	7.59	7.59	7.69	7.56	7.60	7.61	7.70	7.55	7.59	99.42%	98.56%	99.74%	99.48%
	Maintenance	98.56%	98.95%	99.21%	99.48%	99.61%	99.21%	99.34%	99.61%	99.34%	99.08%	99.60%	99.61%	99.48%	99.48%	99.74%	99.61%	99.61%	99.74%	99.60%	99.48%				
3000 hours	Im	7.50	7.49	7.49	7.65	7.58	7.55	7.51	7.58	7.54	7.51	7.51	7.57	7.56	7.68	7.52	7.58	7.59	7.68	7.52	7.57	99.02%	98.17%	99.48%	99.08%
	Maintenance	98.17%	98.17%	98.81%	99.09%	99.08%	98.95%	98.95%	99.08%	98.82%	98.56%	99.08%	99.34%	99.08%	99.35%	99.21%	99.34%	99.35%	99.48%	99.21%	99.21%				
4000 hours	Im	7.44	7.44	7.45	7.61	7.54	7.51	7.48	7.55	7.50	7.48	7.47	7.55	7.51	7.62	7.48	7.55	7.55	7.65	7.49	7.53	98.51%	97.38%	99.09%	98.57%
	Maintenance	97.38%	97.51%	98.28%	98.58%	98.56%	98.43%	98.55%	98.69%	98.30%	98.16%	98.55%	99.08%	98.43%	98.58%	98.68%	98.95%	98.82%	99.09%	98.81%	98.69%				
5000 hours	Im	7.38	7.41	7.41	7.57	7.49	7.47	7.44	7.51	7.45	7.43	7.42	7.49	7.44	7.57	7.43	7.49	7.49	7.58	7.44	7.49	97.85%	96.60%	98.29%	97.98%
	Maintenance	96.60%	97.12%	97.76%	98.06%	97.91%	97.90%	98.02%	98.17%	97.64%	97.51%	97.89%	98.29%	97.51%	97.93%	98.02%	98.17%	98.04%	98.19%	98.15%	98.17%				
6000 hours	Im	7.35	7.37	7.36	7.52	7.44	7.42	7.39	7.47	7.41	7.39	7.38	7.42	7.41	7.52	7.36	7.42	7.42	7.51	7.38	7.4	97.16%	96.20%	97.65%	97.25%
	Maintenance	96.20%	96.59%	97.10%	97.41%	97.25%	97.25%	97.36%	97.65%	97.12%	96.98%	97.36%	97.38%	97.12%	97.28%	97.10%	97.25%	97.12%	97.28%	97.36%	96.99%				

Chromaticity shift

	Sample no.	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#	13#	14#	15#	16#	17#	18#	19#	20#	Avg.	Min.	Max.	Med
0 hour	U'	0.2503	0.2498	0.2495	0.2499	0.2501	0.2497	0.2501	0.2499	0.2493	0.2503	0.2489	0.2493	0.2500	0.2489	0.2495	0.2498	0.2501	0.2500	0.2493	0.2496	0.2497	0.2489	0.2503	0.2498
	V'	0.5195	0.5187	0.5193	0.5202	0.5196	0.5184	0.5185	0.5176	0.5182	0.5201	0.5175	0.5187	0.5199	0.5192	0.5174	0.5182	0.5196	0.5187	0.5181	0.5175	0.5187	0.5174	0.5202	0.5187
	Chromaticity shift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1000 hours	Chromaticity shift	0.0004	0.0004	0.0005	0.0003	0.0004	0.0002	0.0003	0.0003	0.0004	0.0003	0.0003	0.0002	0.0002	0.0004	0.0003	0.0004	0.0005	0.0004	0.0004	0.0002	0.0003	0.0002	0.0005	0.0003
2000 hours	Chromaticity shift	0.0007	0.0010	0.0009	0.0007	0.0008	0.0006	0.0007	0.0006	0.0007	0.0006	0.0006	0.0006	0.0006	0.0004	0.0008	0.0006	0.0008	0.0006	0.0004	0.0006	0.0007	0.0004	0.0010	0.0007
3000 hours	Chromaticity shift	0.0012	0.0013	0.0014	0.0012	0.0013	0.0012	0.0012	0.0010	0.0013	0.0008	0.0010	0.0010	0.0009	0.0010	0.0009	0.0011	0.0013	0.0009	0.0009	0.0010	0.0011	0.0008	0.0014	0.0011
4000 hours	Chromaticity shift	0.0017	0.0018	0.0017	0.0016	0.0017	0.0017	0.0014	0.0014	0.0015	0.0014	0.0013	0.0013	0.0012	0.0013	0.0013	0.0016	0.0018	0.0012	0.0012	0.0014	0.0015	0.0012	0.0018	0.0014
5000 hours	Chromaticity shift	0.0022	0.0024	0.0025	0.0023	0.0018	0.0021	0.0017	0.0018	0.0018	0.0017	0.0016	0.0017	0.0014	0.0016	0.0016	0.0018	0.0021	0.0015	0.0016	0.0017	0.0018	0.0014	0.0025	0.0018
6000 hours	Chromaticity shift	0.0025	0.0028	0.0029	0.0026	0.0024	0.0023	0.0021	0.0022	0.0021	0.0020	0.0019	0.0021	0.0018	0.0018	0.0019	0.0023	0.0024	0.0017	0.0020	0.0021	0.0022	0.0017	0.0029	0.0021



--- End of Report ---