

Recommendations for LED lighting products in China

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- **General requirements**
- **Special requirements**
 - **LED street/tunnel lighting**
 - **Self ballasted LED reflectors**
 - **Self ballasted LED downlights**
- **Test requirements**





General requirements





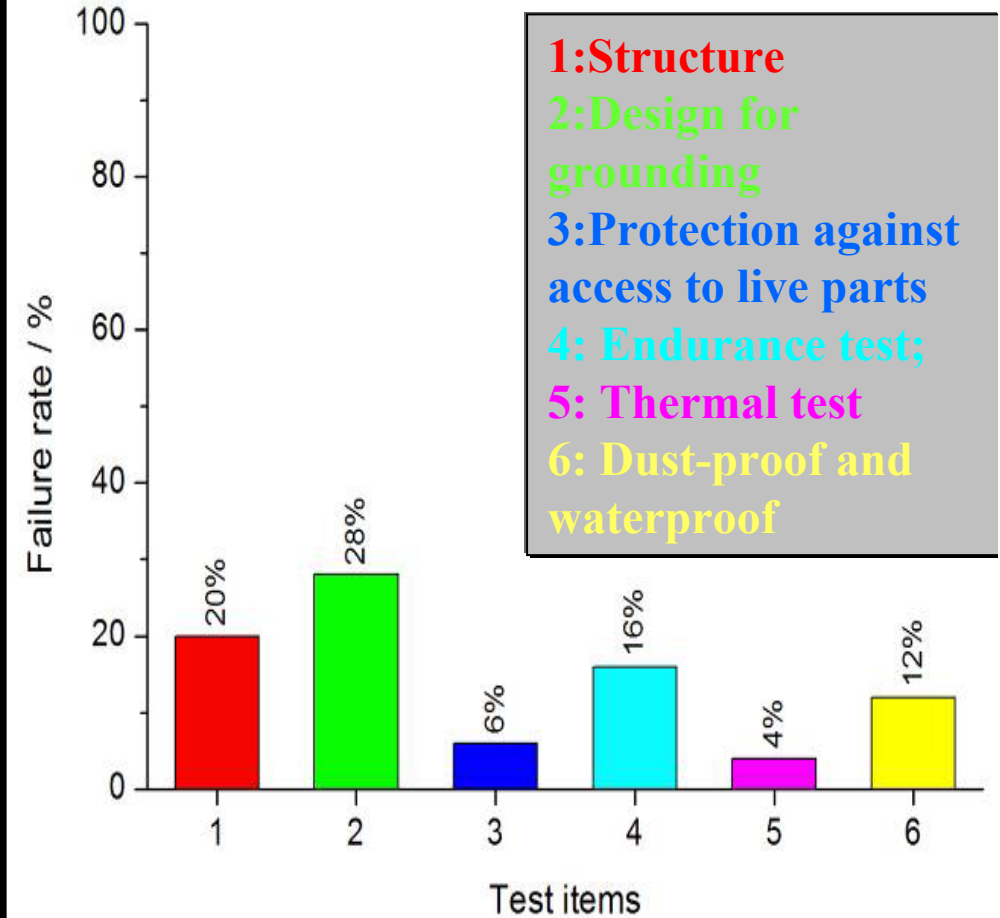
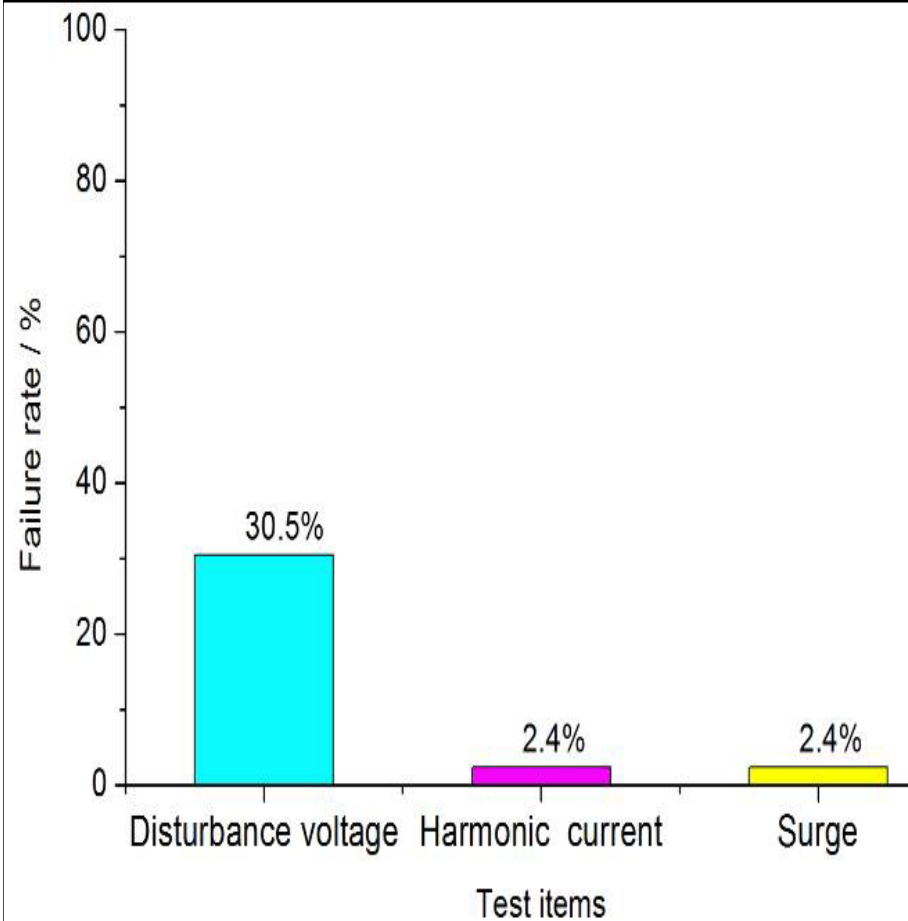
General requirements

- **EMC requirements**
 - **GB17743 (CISPR15:2005)**
 - **GB17625.1 (IEC61000-3-2:2001)**
 - **GB/T18595 (IEC61547:1995)**
- **Safety requirements**
 - **GB7000.1 (IEC60598-1:2003)**
 - **GB7000.5 (IEC60598-2-3:2002)**
 - **GB14196.1/GB14196.2 (IEC60432-1:2005/IEC60432-2:1999)**
 - **GB7000.201/GB7000.202 (IEC60598-2-1/IEC60598-2-4)**





General requirements



EMC/Safety items test results for street lighting





General requirements

- **Basic requirements**
 - Rated voltage as 220VAC (applied voltage range is also feasible)
 - Deviation of tested power from rated one should be less than 15%
- **Requirement for use**
 - Products should work stable when the voltage is 92% ~106% rated voltage
 - Products should work stable with environment temperature as $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$





Special requirements





Special requirements

- **1st paper**
 - LED street/tunnel lighting
- **2nd paper**
 - Self ballasted LED reflectors
- **3rd paper**
 - Self ballasted LED downlights





1st paper

LED street/tunnel lighting





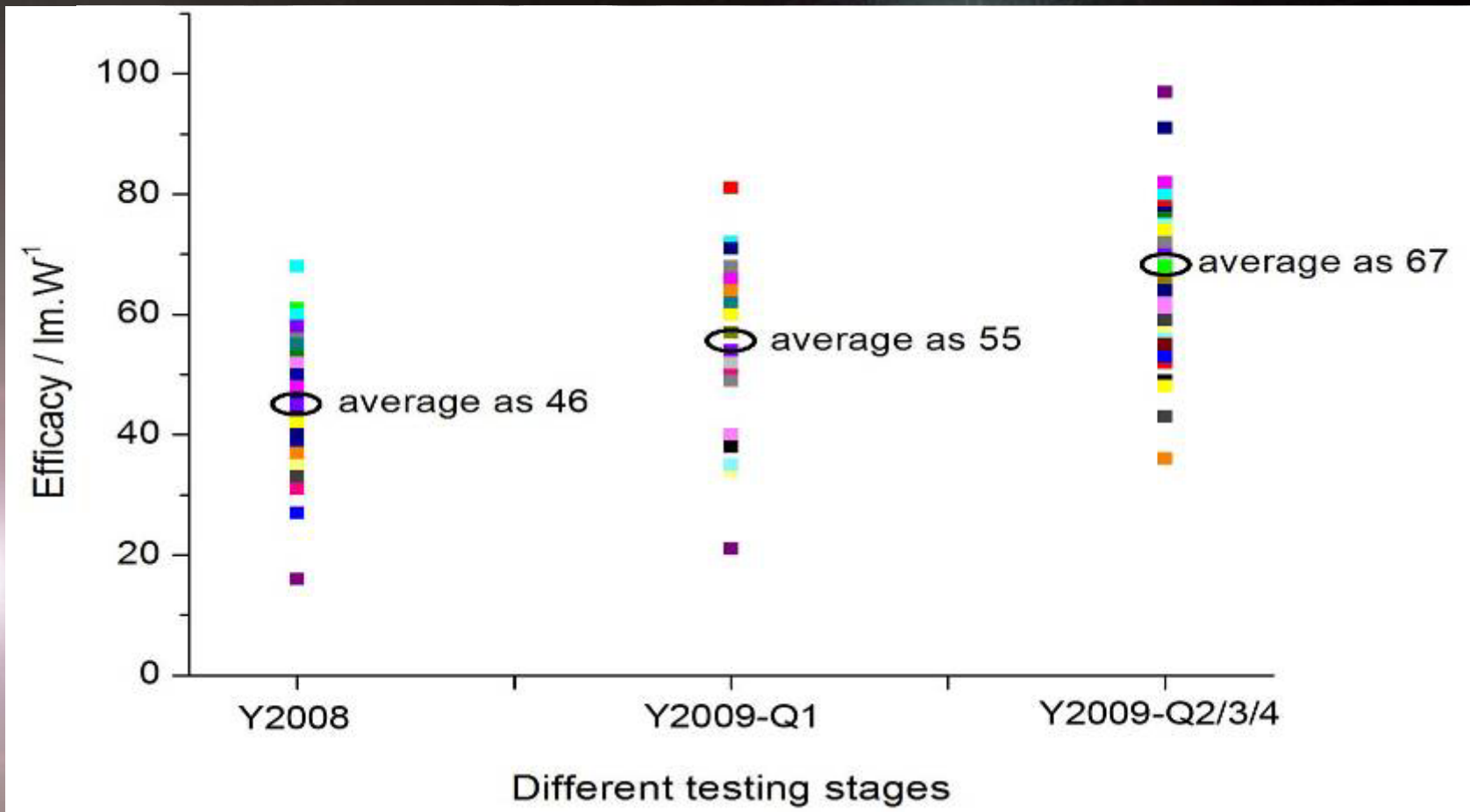
Classification

- How about the traditional ones?
 - Watt for HPS.
- What is the output?
 - Fixed watt with almost fixed lumen output.
- Suitable for LED street lighting?
 - Because of its “in developing”, efficacy increases in 20%~30% per year.





Classification





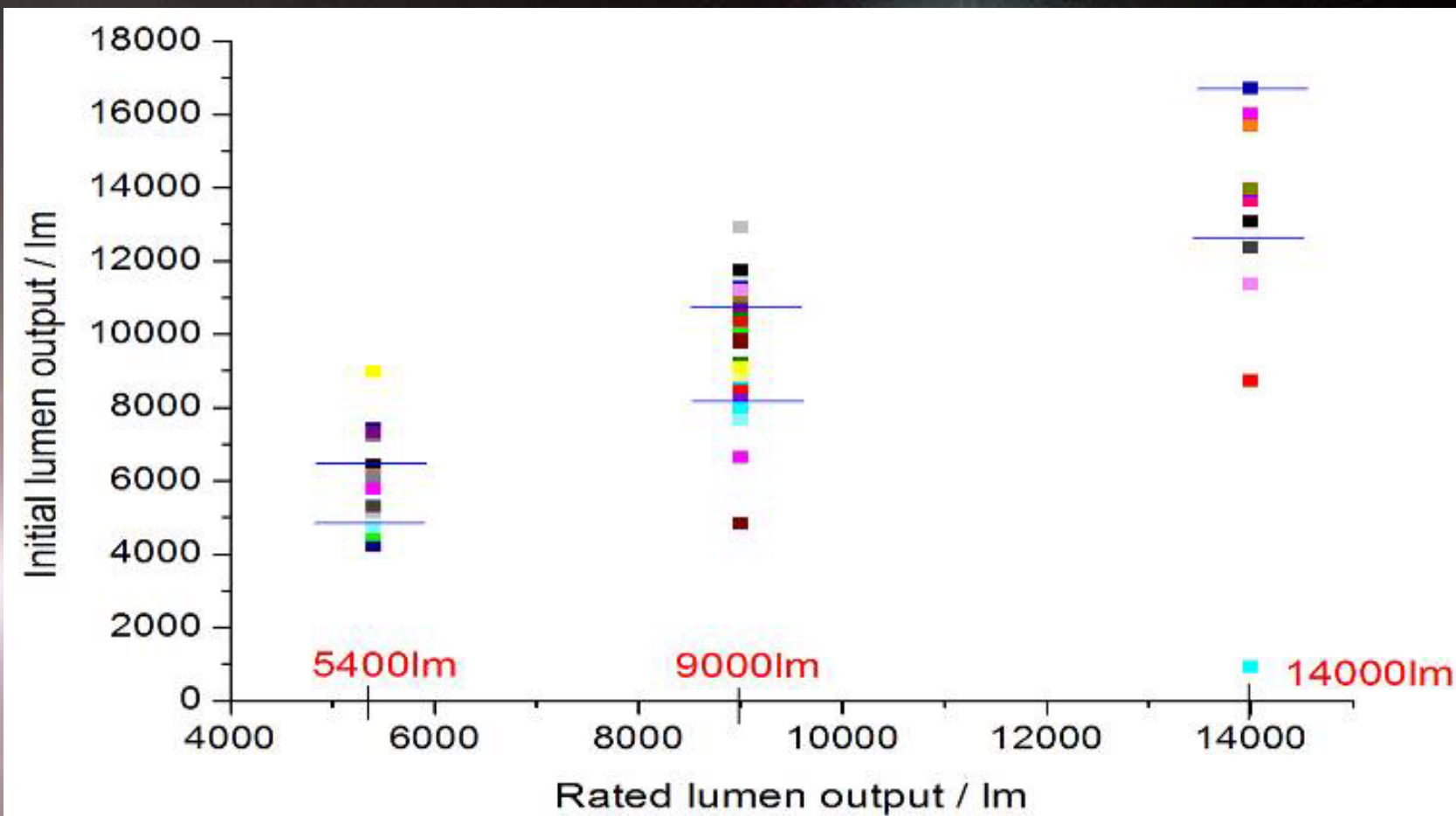
Classification

- Then how about LED street lighting?
 - Rated lumen output + rated CCT
 - as
 - 3000lm/5400lm/9000lm/14000lm
 - Lower CCT(\leq 3300K)
 - higher CCT(>3300K)





Initial lumen output requirements



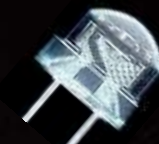
Deviation from the rated value should be within -10%~+20%



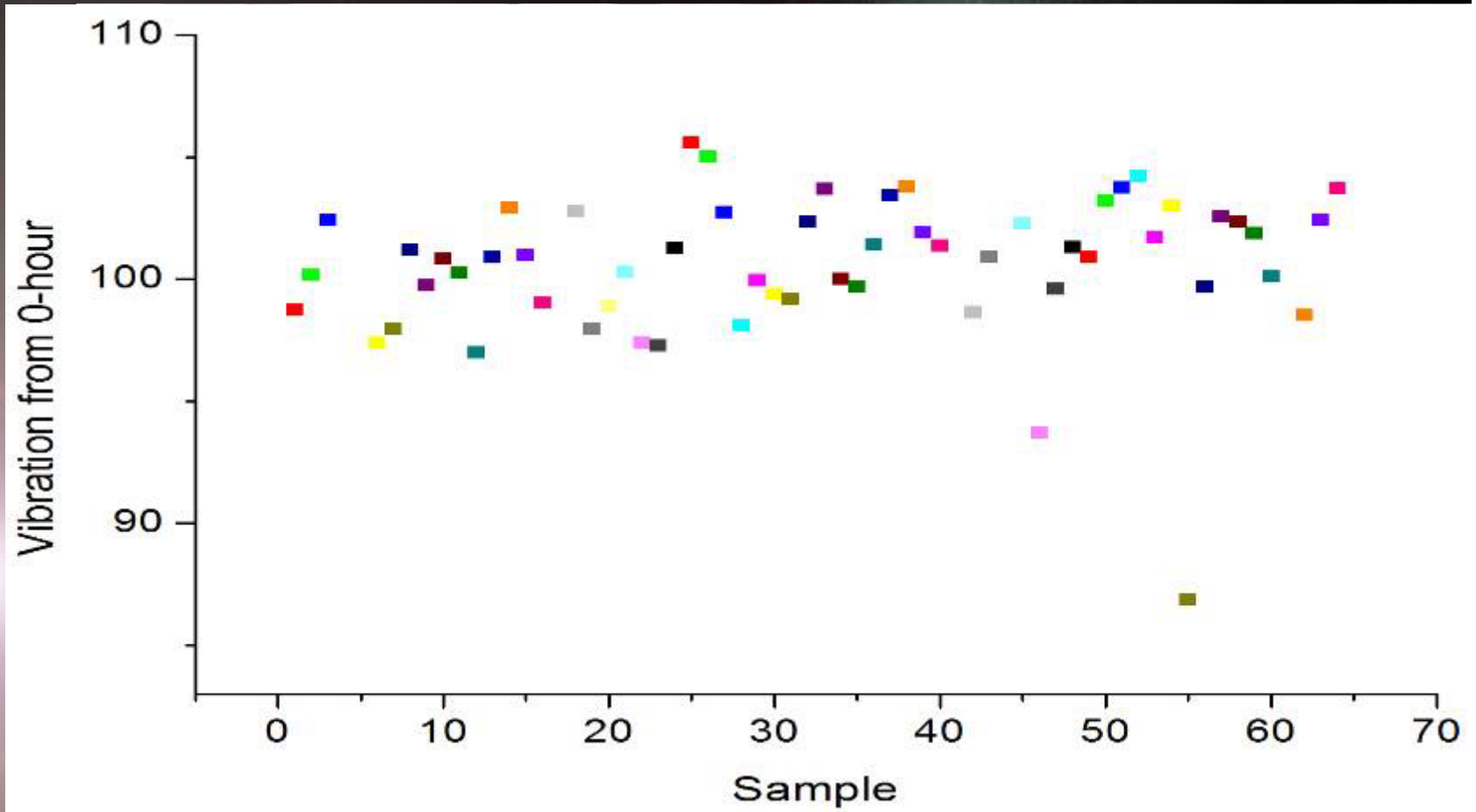
Initial value

- **Initial value**
 - **After aging for 1000 hour**
 - **Initial lumen output, initial efficacy, initial light distribution, initial CCT**



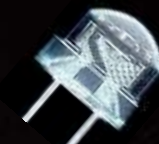


Why initial value at 1000-hour?

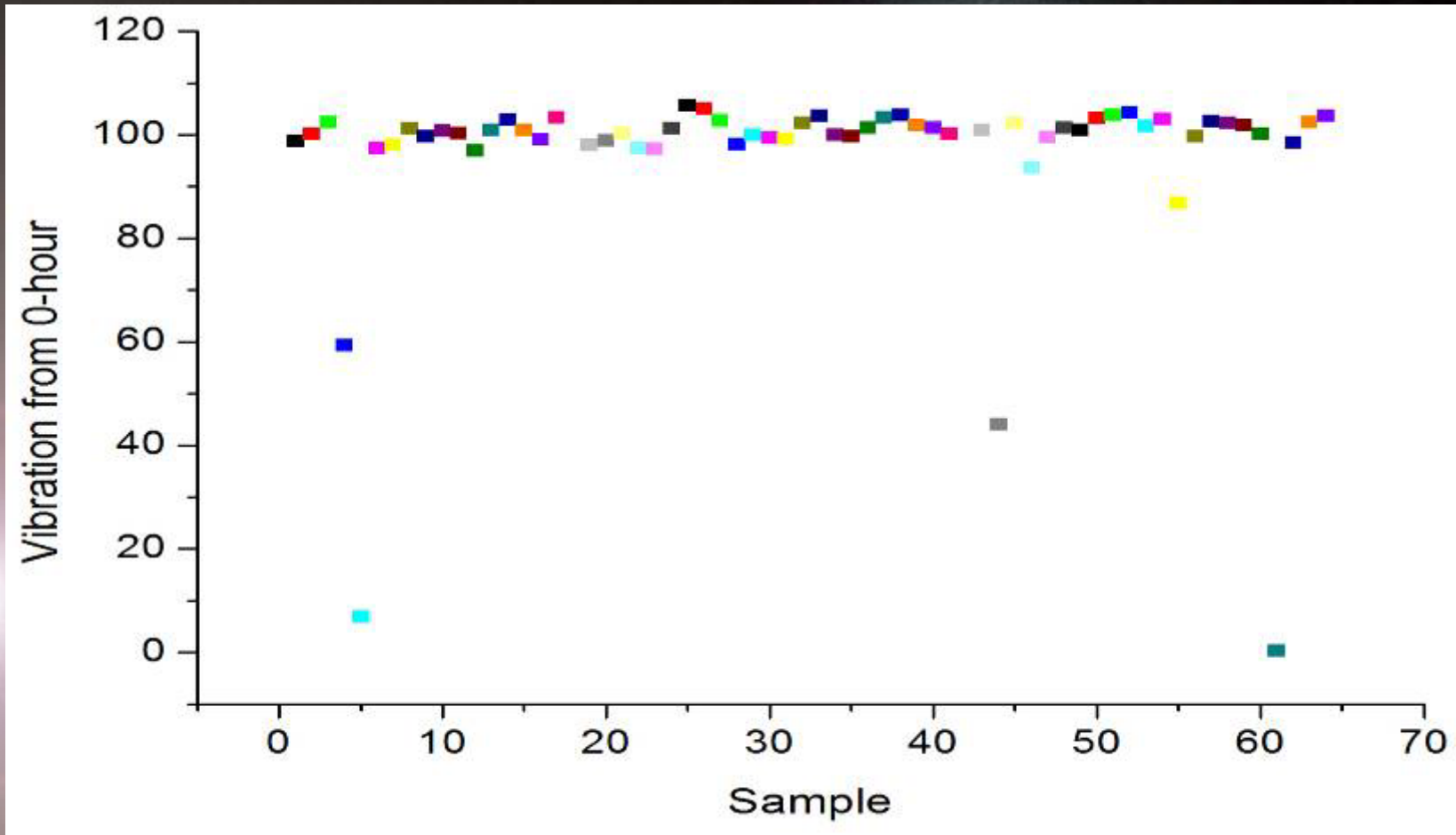


lumen output result at 1000-hour





Why initial value at 1000-hour?



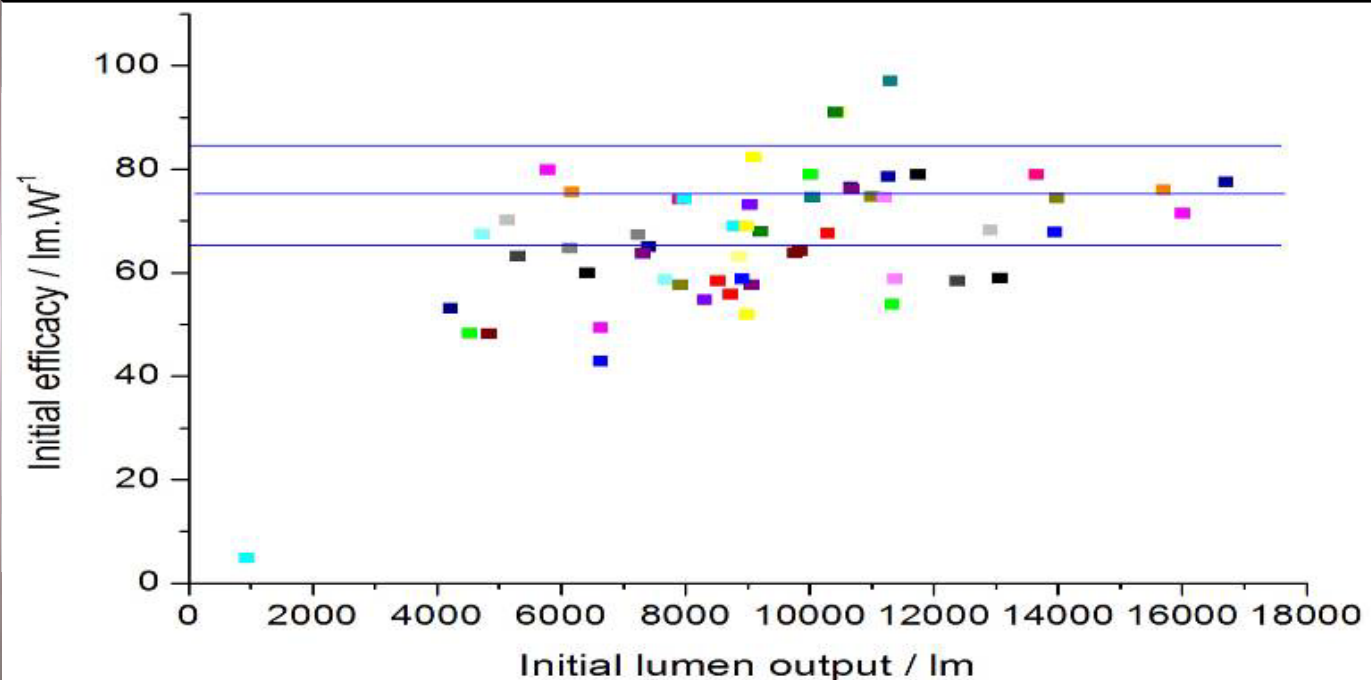
lumen output result at 1000-hour





Initial efficacy requirements

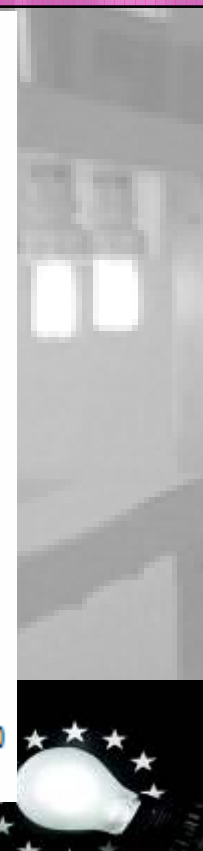
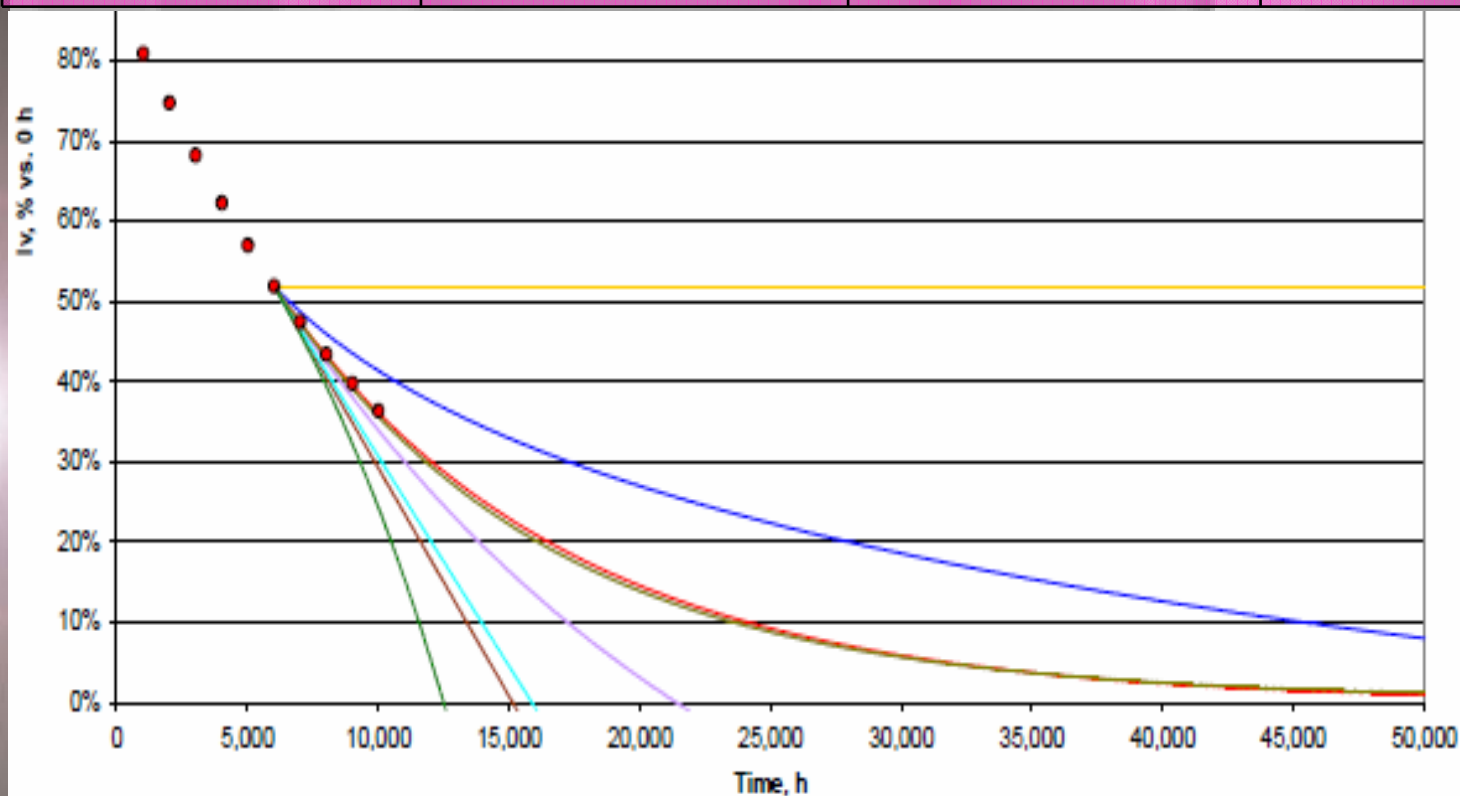
Products	Minimum requirement (lm/W)			
	Rated CCT ≤ 3300K	3300K < Rated CCT ≤ 6500K		
		Level A	Level B	Level C
For street lighting	65	85	75	65
For tunnel lighting	68	85	78	68





Lumen maintenance requirements

Minimum requirement			
Time	3000h	6000h	10000h
Value	96%	92%	86%





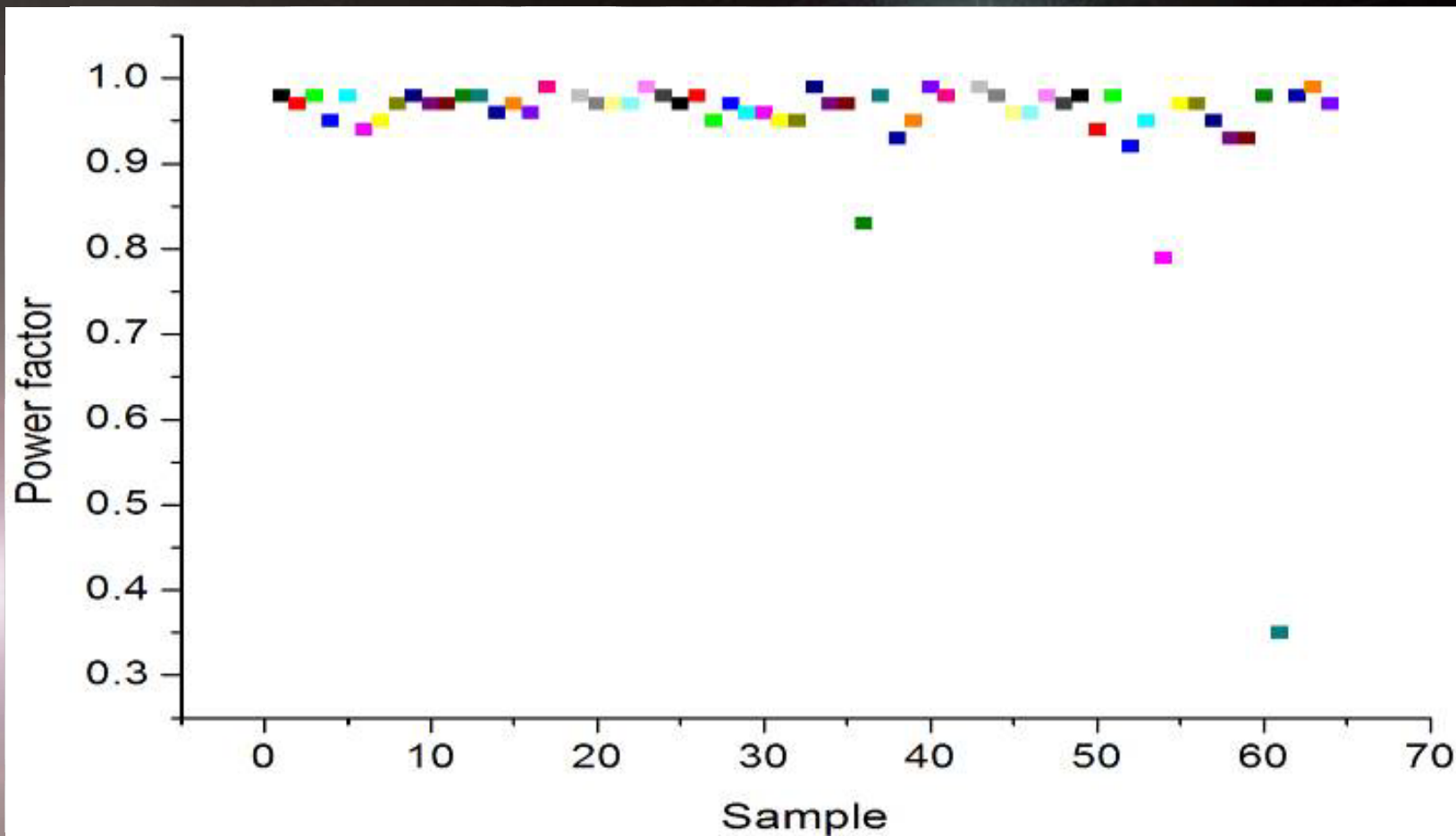
CCT requirements

- **Chromaticity requirement**
 - Rated CCT should not be larger than 6500K
 - 100K as step
 - Deviation of initial value from the rated one should not be larger than ΔT
$$\Delta T = (0.0000108 \times T^2 + 0.0262 \times T + 8)$$



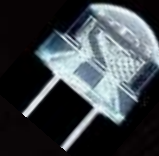


Power factor requirements



Power factor should be no less than 0.90

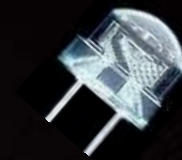




Lighting effect requirements

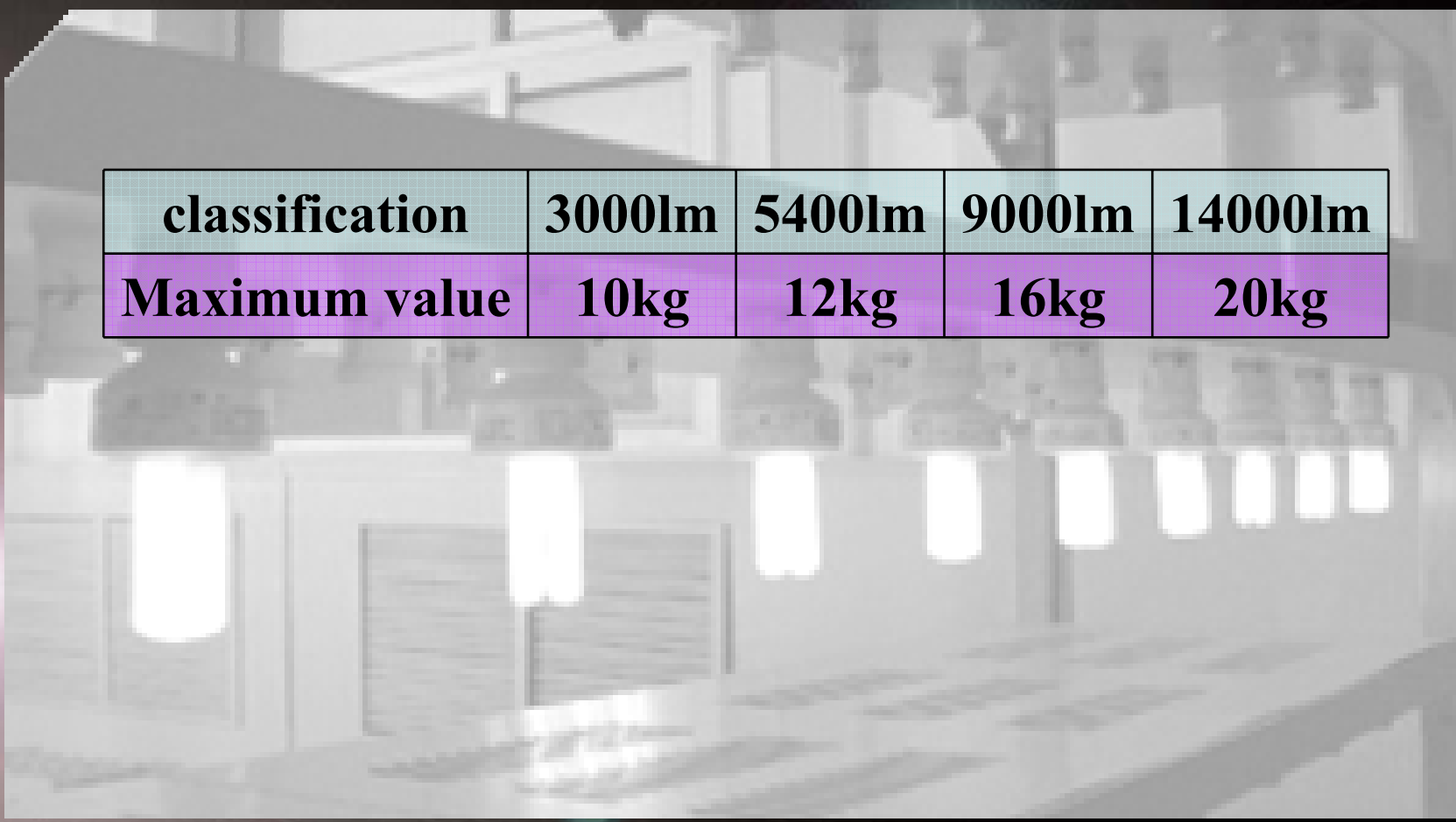
- **Parameters needed**
 - Light distribution and designated environment conditions
 - Including pole height and any other install requirements
- **Design requirements**
 - Lighting for street lighting should meet the requirements of CJJ45-2006
 - Lighting for tunnel lighting should meet the requirements of JTJ 026.1-1999





Weight requirement

classification	3000lm	5400lm	9000lm	14000lm
Maximum value	10kg	12kg	16kg	20kg





2nd paper

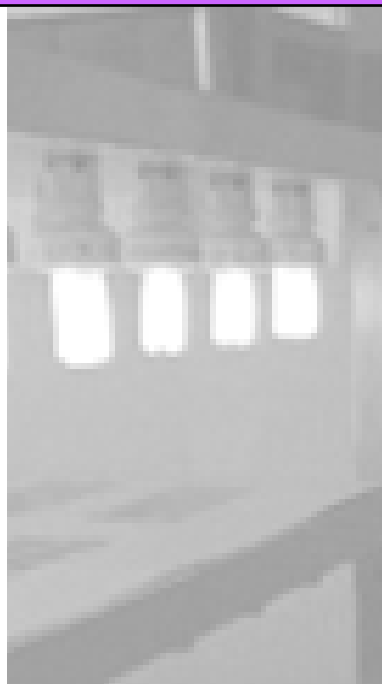
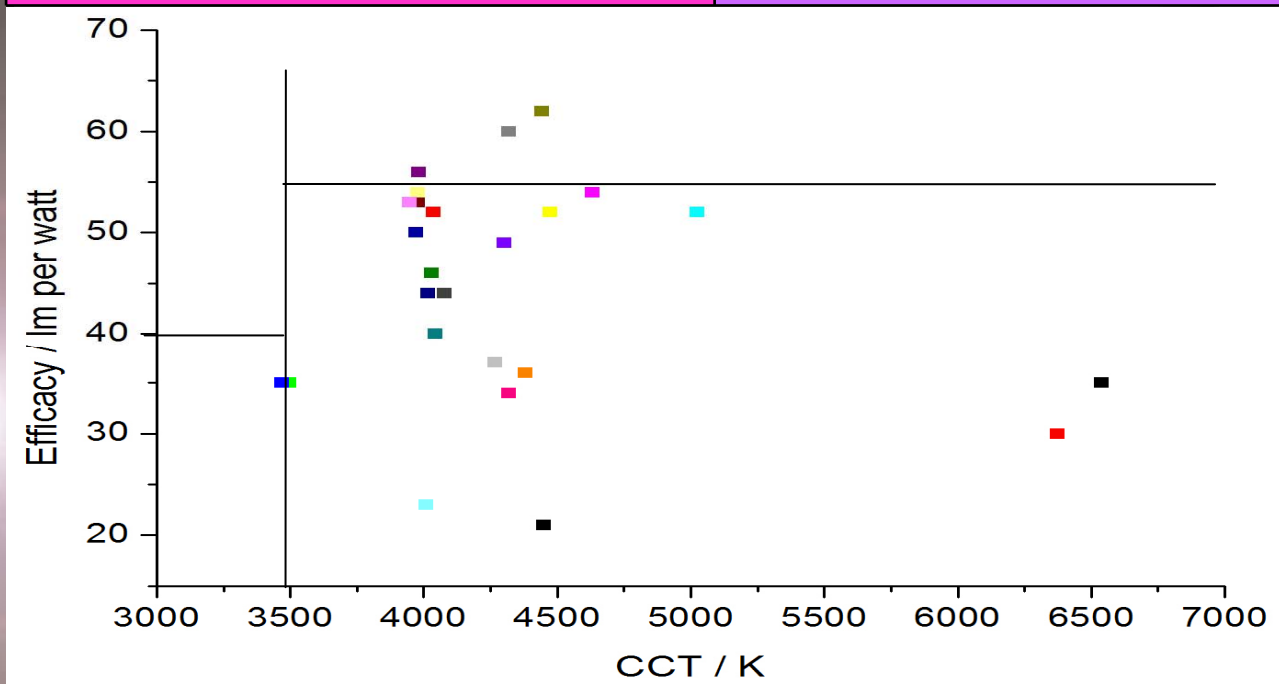
Self ballasted LED reflectors





Initial efficacy requirements

Minimum requirement (lm/W)	
Rated CCT ≤ 3500K	3500K < rated CCT ≤ 6500K
40	55

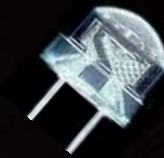




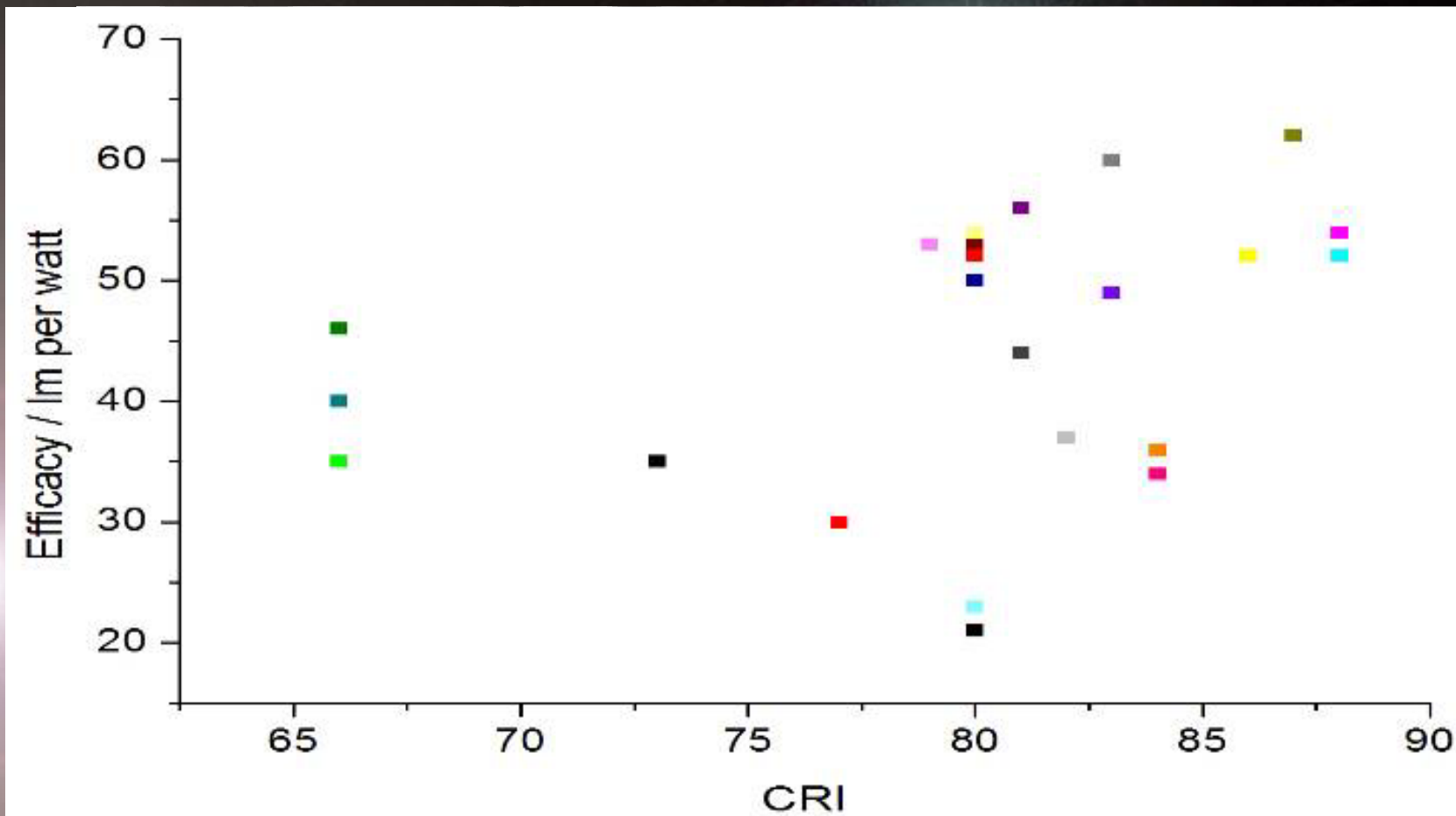
CCT requirements

Rated	Initial	Duv and tolerance
2700K	2725 ± 145	0.000 ± 0.006
3000K	3045 ± 175	0.000 ± 0.006
3500K	3465 ± 245	0.000 ± 0.006
4000K	3985 ± 275	0.001 ± 0.006
4500K	4503 ± 243	0.001 ± 0.006
5000K	5028 ± 283	0.002 ± 0.006
5700K	5665 ± 355	0.002 ± 0.006
6500K	6530 ± 510	0.003 ± 0.006





CRI requirements



Average value should not be less than 85

Initial for individual product should not be less than 82





CRI maintenance requirements

- **For average**
 - degradation at 3000h should not be larger than 3
- **For individuals**
 - degradation at 3000h should not be larger than 5





Minimum CBCP requirements

		JDR						
		Initial lumen output (lm)						
		50	150	250	300	350	400	500
Beam angle (°)	10	1490	2387	3592	4305	5079	5900	7598
	20	621	996	1498	1796	2119	2461	3169
	30	315	505	760	911	1075	1248	1607
	40	194	311	469	562	663	770	992
	50	146	234	352	421	497	578	744
	60	133	213	321	384	454	527	679

Beam angle with 60° as maximum value



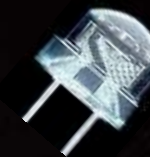


Minimum CBCP requirements

		PAR20					
		Initial lumen output (lm)					
		150	250	300	350	400	500
Beam angle (°)	10	1193	1644	1922	2239	2601	3478
	20	555	765	894	1042	1210	1618
	30	308	424	494	578	671	898
	40	204	281	328	382	444	593
	50	160	221	258	301	350	468
	60	151	208	243	283	329	440

Beam angle with 60° as maximum value



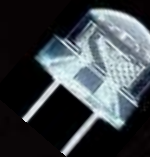


Minimum CBCP requirements

		PAR30									
		Initial lumen output (lm)									
		250	300	350	400	500	650	750	900	1000	1250
Beam angle (°)	10	2988	3402	3862	4371	5549	7760	9561	12786	15289	22686
	20	1294	1473	1672	1893	2403	3360	4140	5536	6620	9823
	30	668	760	863	977	1240	1734	2137	2858	3417	5070
	40	411	468	531	601	763	1067	1315	1758	2103	3120
	50	301	343	390	441	560	783	964	1290	1542	2288
	60	264	300	341	386	489	685	843	1128	1349	2001

Beam angle with 60° as maximum value



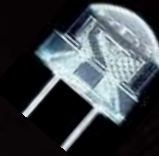


Minimum CBCP requirements

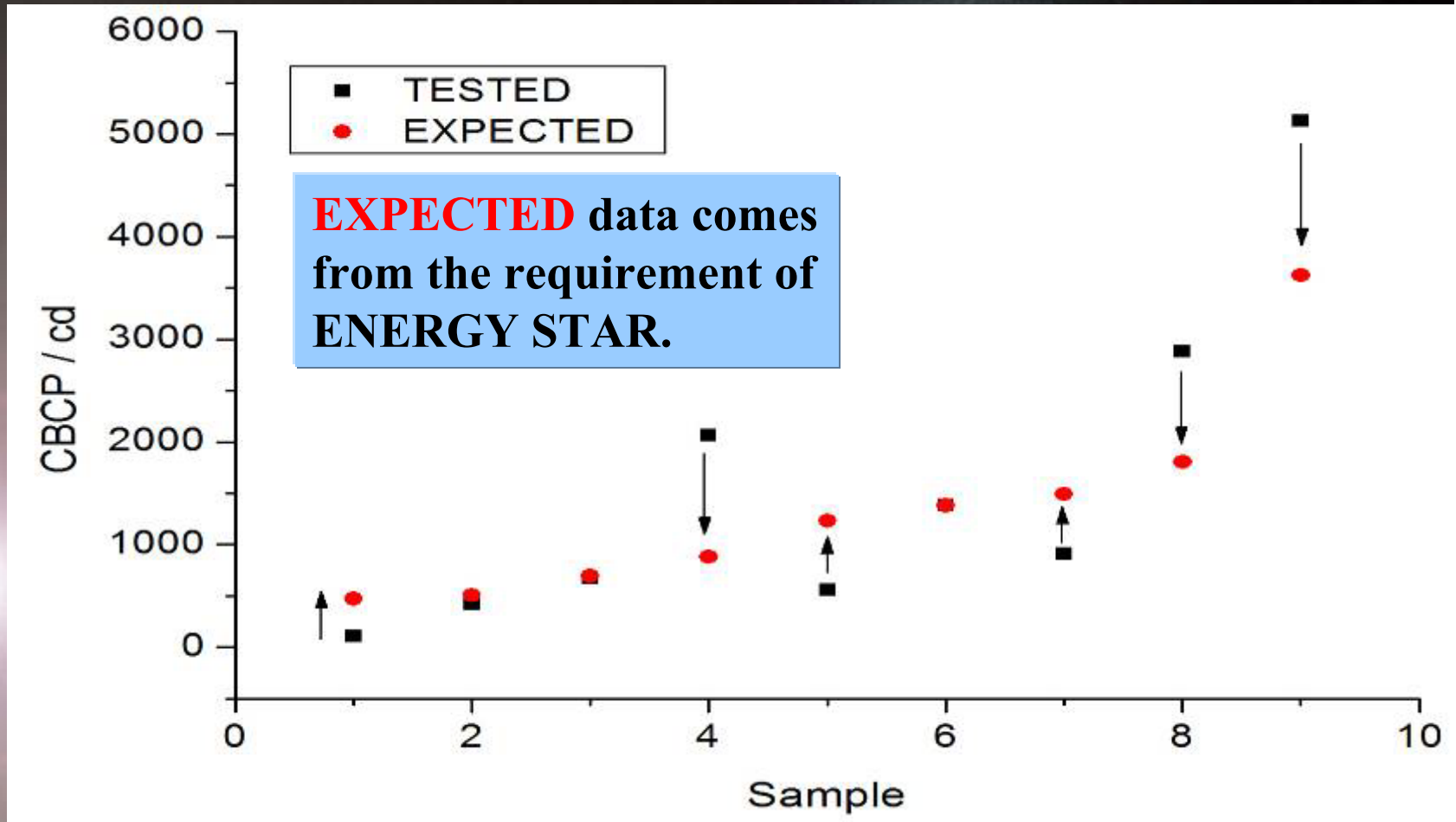
		PAR38							
		Initial lumen output (lm)							
		500	650	750	900	1000	1250	1500	1800
Beam angle (°)	10	6791	8922	10544	13245	15191	20311	25199	29575
	20	2776	3647	4310	5414	6210	8303	10301	12090
	30	1353	1777	2100	2638	3026	4046	5020	5891
	40	786	1032	1220	1533	1758	2350	2916	3423
	50	544	715	845	1061	1217	1628	2020	2370
	60	449	590	698	876	1005	1334	1667	1957

Beam angle with 60° as maximum value



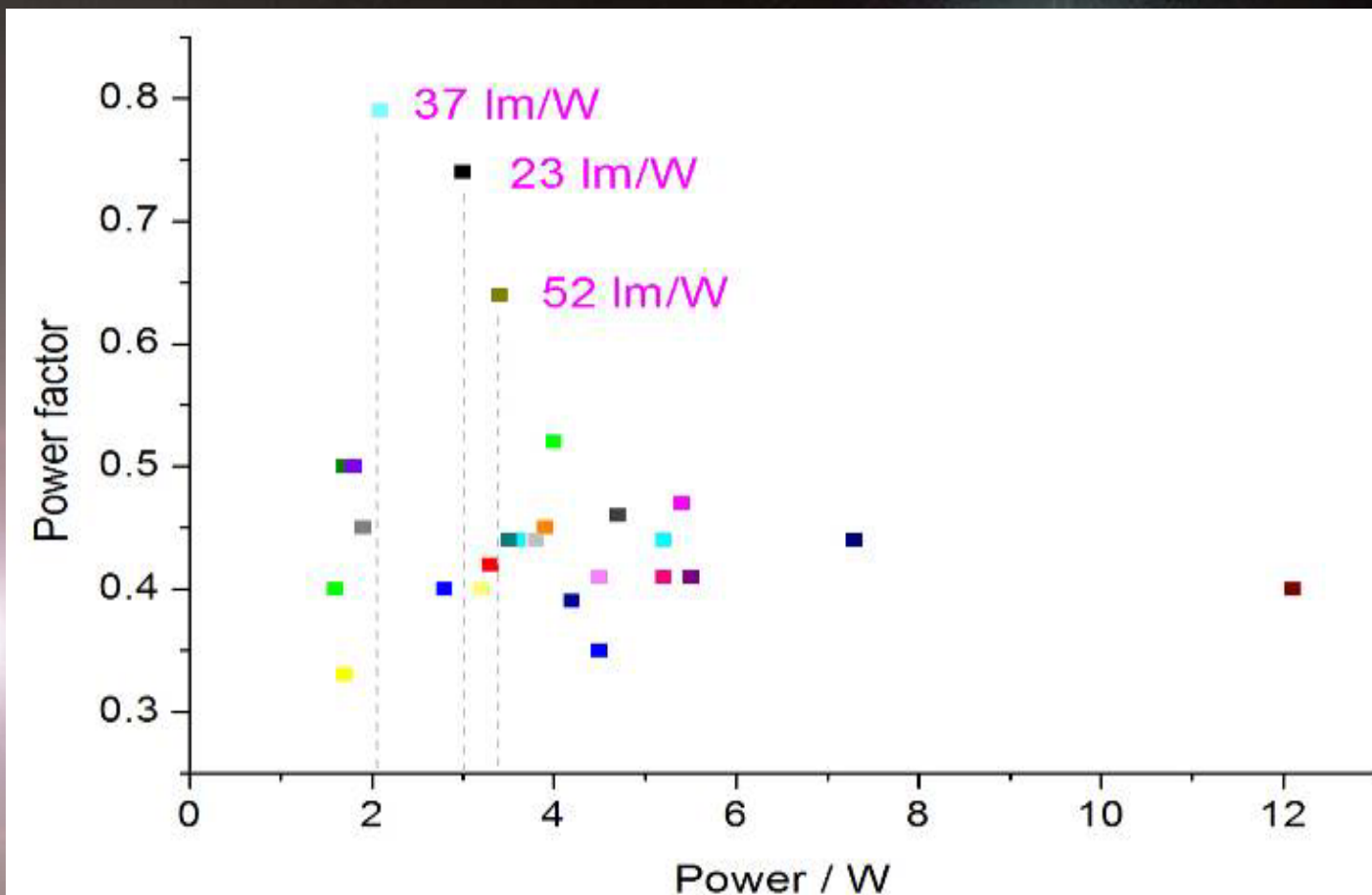


Minimum CBCP requirements





Power factor requirements



Power factor should be no less than 0.70





Lifetime requirements

- **lifetime**
 - No less than 30000h
- **lifetime (for individuals)**
 - Burning time with lumen maintenance as 70%
- **Rated lifetime**
 - Average burning time for 50% self ballasted LED reflectors meet its lifetime





3rd paper

Self ballasted LED downlights



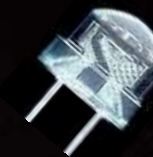


Initial efficacy requirements

- Initial efficacy

Minimum requirement (lm/W)	
Rated CCT \leq 3500K	3500K < Rated CCT \leq 6500K
47	60





CCT requirements

Rated CCT	Initial CCT	Duv and tolerance
2700K	2725 ± 145	0.000 ± 0.006
3000K	3045 ± 175	0.000 ± 0.006
3500K	3465 ± 245	0.000 ± 0.006
4000K	3985 ± 275	0.001 ± 0.006
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CRI requirements

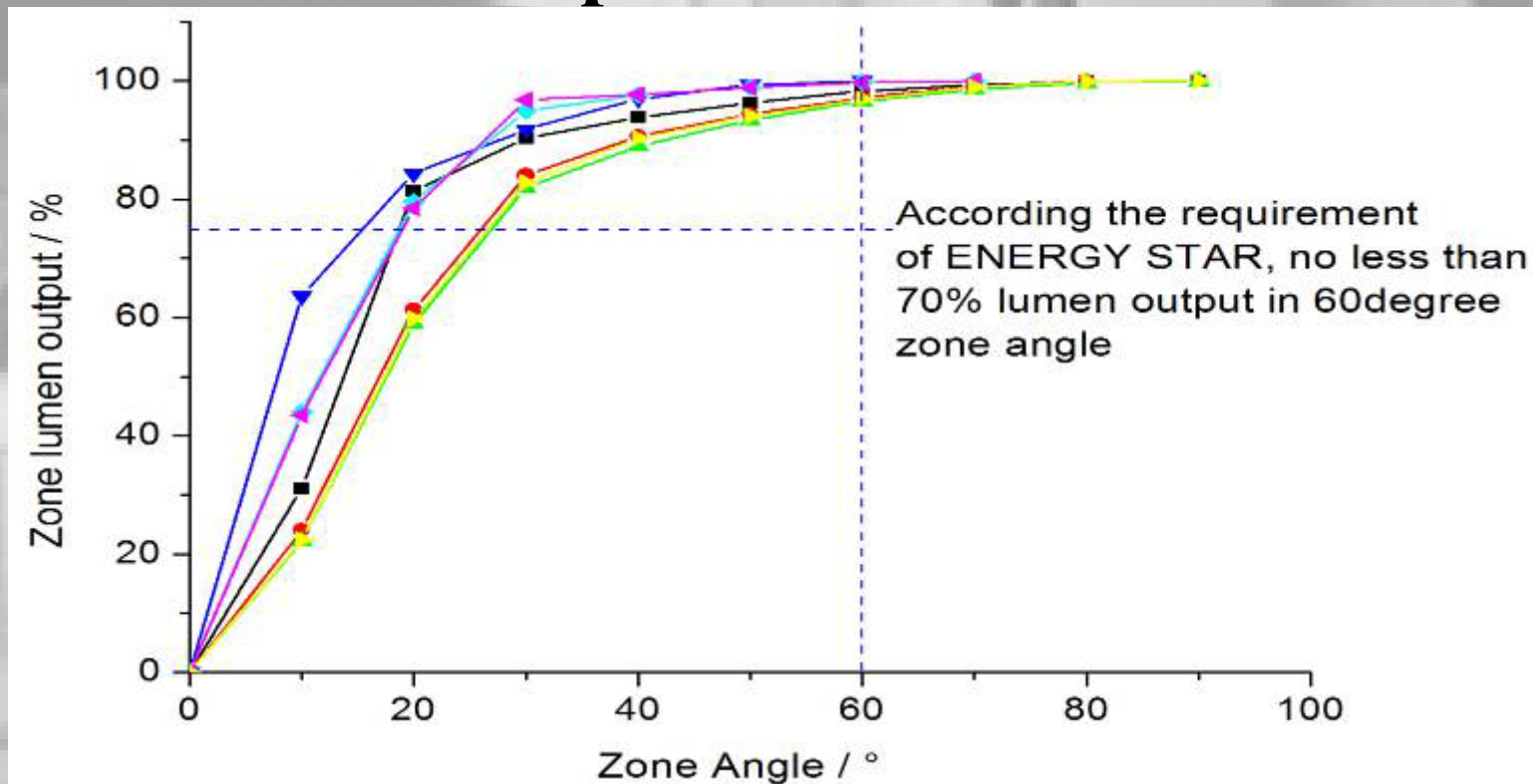
- **CRI**
 - Average initial CRI should not be less than 80
 - For individuals, should not be less than 77
- **CRI maintenance requirement**
 - Degradation for average CRI at 3000h should not be larger than 3
 - For individuals, should not be larger than 5

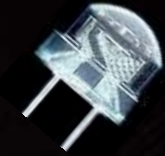




Zone lumen output requirements

- **Zone lumen output**





Other requirements

- **Power factor**
 - No less than 0.90
- **lifetime**
 - No less than 30000h
- **lifetime (for individuals)**
 - Burning time with lumen maintenance as 70%
- **Rated lifetime**
 - Average burning time for 50% self ballasted LED downlights meet its lifetime





Test requirements





Test requirements

- **Environment requirement of lab**
 - Ambient temperature for photometric measurement is $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$
 - Ambient temperature for lifetime test is $25^{\circ}\text{C} \pm 15^{\circ}\text{C}$
- **Voltage requirement for power supply**
 - 50Hz 220V sinusoidal wave form
 - Within $\pm 0.5\%$ vibration for stabilization
 - Within $\pm 0.2\%$ vibration for measurement
 - Within $\pm 2\%$ vibration for lifetime test





Test requirements

- **Seasoning and lifetime test for street lighting**
 - **On for 11.5h, off for 0.5h**
 - **Off time is not included as lifetime**
 - **Seasoning and aging should be performed with full-load**





Testing requirements

- **Initial photometric and chromaticity**
 - After seasoning for 1000h, and with performance stabilized
 - Goniphotometer for initial photometric measurement
 - Sphere for initial chromaticity
 - Wall area for 4π sphere \geq surface area of tested product $\times 50$
 - Diameter for 2π sphere \geq opening size on sphere surface $\times 3$





Thank you!

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