

LED Testing - results

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Introduction

- LEDs have been seen as a developing lighting technology that has great potential to be an efficient lighting alternative in the future.
- Technology is developing rapidly in some cases already offering effective and efficient alternatives to traditional lighting.
- Evaluation of LED products currently available in the marketplace indicates a wide variation in quality and efficacy.



LED Quality

CALIPER tests in US demonstrates a wide variation and also significant variation between product performance claimed by manufacturers and test results – especially light output and efficacy.

www1.eere.energy.gov/buildings/ssl/caliper.html



Performance and Perception

Misinformation and/or poor performance has the potential to impact upon consumer perception of LEDs as an alternative efficient lighting product.

 Accurate information on product performance and equivalency is important to ensure that consumers understand what they are buying.



Performance and Perception

- Particularly important given current early adopters will often be paying high prices in comparison with other lighting alternatives
- □ Some of the less efficient LEDs may potentially
 - become unwanted alternatives to already proven
 - efficient lighting such as CFLs for uninformed





Key Attributes - Domestic

- Lumen package (including claimed equivalence)
- □ Beam Angle
- Colour (maintenance, spectral output, spatial uniformity, UV)
- Dimming capacity
- Lifetime, premature failure, rapid cycle switch, end of life behaviour
- □ Lumen maintenance
- Power Factor, harmonics
- □ Efficacy



LED Testing

We have commenced testing of a range of LED products purchased in Australia and overseas:

□ to further understand the quality and performance attributes of products currently available to consumers.

□ to examine available test methods as applied to LEDs



LED Testing

Australian tests to date have shown significant variation in quality and performance attributes between required (or claimed) and measured



LED Performance Testing

- Comparison of measured performance with manufacturer/supplier ratings
 - \Box Power consumption \neg -- Efficacy (Lm/W)
 - □ Luminous flux

- Correlated Colour Temperature (CCT)
- □ Beam angle
- □ Claimed Life Time
- Cost per lumen of output (normalised value)
- Dimming characteristics

















Equivalency Claims

Rated vs Measured



Equivalence Claims

Packaging that suggests
replacement wattage for
incandescent/halogen lamps is
not achieving like-for-like
lumen output.





Equivalence Claims









Colour Temperature

















Cost per 100 lamp lumens

Expect to see a decrease in cost/lumen as lumens increase for a single package





- Of lamps tested, most higher lumen packages were Australian
- Many Australian lamps show higher light outputs for the same cost/lumen





Life Time of Tested LEDs

- Within lamp cap types, recent test results show a broad range of life times.
- Little similarity between cap groups in quoted life time bands







| Lamp Cap | E26/E27 | GU10 | GU5.3 | Fixture |
|-----------------|-------------|-------------|-------------|-------------|
| Life Time (hrs) | No of Lamps | No of Lamps | No of Lamps | No of Lamps |
| 12 000 | | 1 | | |
| 15 000 | 1 | 2 | | |
| 20 000 | 3 | | 1 | |
| 25 000 | | 5 | | |
| 35 000 | | 1 | 4 | |
| 40 000 | 1 | | | |
| 45 000 | | | 1 | |
| 50 000 | 3 | 3 | 2 | 2 |
| 100 000 | | | | 1 |









Dimmable LED Luminous Flux to Lamp Power Characteristics

Relative Dimmed Power (%)



Dimmable LED Efficacy to Lamp Power Characteristics

Relative Dimmed Power (%)