Illuminating
ENGINEERING SOCIETY

IES LM-84-14

Approved Method: **Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires**

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IES Approved Method for Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires

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INTRODUCTION

The method for measuring luminous flux and color maintenance of LED light sources has been documented in IES LM-80-08. At the solid-state lighting (SSL) system level such as LED lamps, light engines, and luminaires, other system components, in addition to the LED light sources, also contribute to luminous flux decay and color change over time. The system performance changes over time can be directly tested at the SSL product level. This document addresses the evaluation of the changes in performance of SSL systems over time and can be a useful tool for engineering evaluations and luminous flux maintenance for entire assemblies when environmental considerations and variability for the base LED deprecation is incorporated into the analysis.

Furthermore, performances of SSL systems, LED integrated lamps, non-integrated lamps, LED light engines, and LED luminaires, are typically but not without exception affected by operational and environmental variables such as operating cycle, conditions imposed by auxiliary equipment and fixtures, ambient temperature, airflow and orientation. This test method has been developed to establish consistent and environmental conditions across laboratories to achieve reproducible results and to permit reliable comparison of results.

1.0 Scope

This document provides the method for measurement of luminous flux and color maintenance of LED lamps, integrated; LED lamps, non-integrated; LED light engines, and LED luminaires. The method describes the procedures to be followed and the precautions to be observed in obtaining and reproducing luminous flux and color maintenance measurements under standard operating conditions.

This approved method does not provide guidance or recommendations regarding sampling, predictive estimations or extrapolation of luminous flux maintenance beyond the final measurement.

2.0 NORMATIVE REFERENCES

2.1 IES LM-79-08, *IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products*.

3.0 DEFINITIONS

3.1 Device Under Test (DUT)

An LED lamp, integrated; LED lamp, non-integrated; LED light engine or LED luminaire that is being tested.

3.2 Luminous Flux Maintenance

Luminous flux maintenance (often referred to as "lumen maintenance") is the remaining luminous flux over the initial flux (typically expressed as a percentage) at any selected elapsed operation time. Luminous flux maintenance is the complement of luminous flux depreciation (or "lumen depreciation").

3.3 Maintenance Test

The continuing steady operation test for the DUT when it is energized.

3.4 Non-Operational DUT

A DUT which, when energized, does not emit light.

4.0 PHYSICAL AND ENVIRONMENTAL CONDITIONS DURING OPERATION AND HANDLING

4.1 General

Variation may occur in luminous flux maintenance values of the DUT due to changes in ambient temperature or air movement due to the DUT's thermal management design. DUTs should be checked and as necessary cleaned prior to measurement and maintenance test. Manufacturers handling instructions (e.g., electro-static discharge or ESD, etc.) shall be observed. Unusual environmental conditions, such as thermal interference from HVAC systems or solar loading, are to be reduced to levels reasonably expected to minimize influence relative to operation when the conditions are removed.

4.2 Mounting DUTs

The DUT shall be mounted in accordance with the manufacturer recommendations

4.3 Vibration

DUTs should not be subjected to excessive vibration or shock during operation or handling.