

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460



OFFICE OF
AIR AND RADIATION

September 9, 2011

Dear ENERGY STAR[®] Lighting Partner, EPA-Recognized Certification Body or Laboratory, Stakeholder or Other Interested Party:

With this letter, the U.S. Environmental Protection Agency (EPA) is finalizing guidance regarding the content and application of lumen maintenance performance data for LED packages, LED arrays and LED modules intended for use in ENERGY STAR qualified solid state lamps and luminaires (“product(s)”). This guidance relates to subcomponent-level performance data and addresses topics not explicitly covered in ENERGY STAR lighting specifications because of the quickly evolving nature of solid state lighting technology, including: the content of IES LM-80-08 (“LM-80”) test reports, case temperature measurements, sample set correlated color temperatures, successor (next generation) devices, and LED array testing. Its objective is to facilitate robust testing which builds upon industry best practices and helps maintain confidence in ENERGY STAR qualified lighting products, while not unnecessarily burdening suppliers to our manufacturing partners. The Agency developed this guidance in consultation with LED package and array manufacturers to ensure it is informed by the latest technological developments with solid state lighting subcomponents. A draft was distributed on June 24, 2011 for stakeholder review.

The feedback received by EPA in response to the June 24th draft focused on three primary topics:

Testing requirements for LED arrays: In response to stakeholder input concerning the testing of large and small LED arrays to represent a range of array sizes, the guidance was changed to require testing of a worst-case scenario (i.e. the largest LED array anticipated to be used in a qualified product), and permits that data to represent smaller arrays. In addition, EPA believes the revised testing approach adequately addresses the Agency’s concerns about the contribution of wire bond failures to lumen depreciation in LED arrays without calling for variations in wiring configurations across test samples.

Remote phosphor configurations: The Agency notes a lack of industry standardized definitions for topics related to ‘remote phosphor’ (i.e. where blue LED dies or LED packages are placed at a distance from the phosphor that produces white light). In particular, the question arises, what minimum distance must separate the phosphor, and/or what other parameter(s) must be satisfied, for the term to apply. Questions are also outstanding about the optical performance, and the potential for degradation of, other materials comprising the space between the blue LEDs and the phosphor (commonly referred to as the ‘mixing chamber’), and the contribution of mixing chamber geometry to lumen and color maintenance. The piecemeal approach of selecting blue LEDs, phosphor, substrate and mixing chamber materials is not presently supported by industry

standards which EPA-Recognized Certification Bodies can reference when determining compliance with ENERGY STAR lumen maintenance requirements. Since LM-80 includes scope for evaluating the lumen maintenance of remote phosphor LED modules, where the above elements are incorporated into one testable unit, EPA intends to maintain this approach while following industry efforts to address these topics.

Successor subcomponent provisions: Questions were raised concerning the relevance of some elements of the “successor” definition. In response, EPA concluded that removing LED die size, and subcomponent packaging size from the successor definition will not have a negative effect on the quality or comparability of successor lumen maintenance data. Regarding the restrictions placed on deposition processes and drive current, changes have been made to clarify those portions of the definition. Feedback indicated general agreement with the definition language regarding the optical path and thermal resistance. The other elements of the successor definition were maintained to ensure that direct comparisons of successor and original LM-80 reports can easily be conducted by EPA-Recognized Certification Bodies.

In addition to the above, language was clarified regarding color temperature tolerances, subcomponent model and series numbers, and LED array substrates. Reporting requirements included in the Luminaires V1.1 specification were added to section 3.2 for consistency.

EPA intends for LM-80 testing and reporting to follow this guidance going forward, while providing allowances detailed in the guidance for testing and reporting already completed, as well as testing which is currently underway or in the final planning stages.

The Agency recognizes that this technology is rapidly evolving, and that the solid state lighting industry is in the process of working towards consensus on some outstanding technical issues. Due to the rapidly changing nature of the market, while this document is final, EPA will continue to track progress and testing results to determine when changes to this document are necessary.

EPA appreciates the efforts by partners and stakeholders to provide detailed feedback on this guidance document. Questions or concerns about this final document should be directed to my attention at (202) 343-9272, or baker.alex@epa.gov.

Thank you for your support of the ENERGY STAR lighting product labeling program.

Sincerely,



Alex Baker
ENERGY STAR Lighting Program Manager
U.S. Environmental Protection Agency