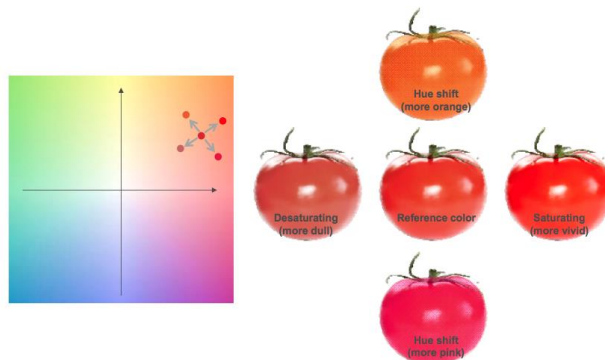


Keeping Track of Color: TM-30-15

A NEW COLOR FIDELITY INDEX for LED and Light Measurement

The International Commission on Illumination (CIE) is the worldwide recognized source for standards in illumination who, in 1965, published the Color Rendering Index (CRI) and the general color rendering index, Ra, for assessing the color rendering of light sources. This index has been the industry standard for color rendering for the past several decades.



CIE defines color rendering:

“Effect of an illuminant on the color appearance of objects by conscious or subconscious comparison with their color appearance under a reference illuminant.”

The explosion of new lighting technologies and advancements in science exposed limitations in the 1964 standard, including issues capturing hue and saturation. The CIE cited two main limitations of the old CRI:

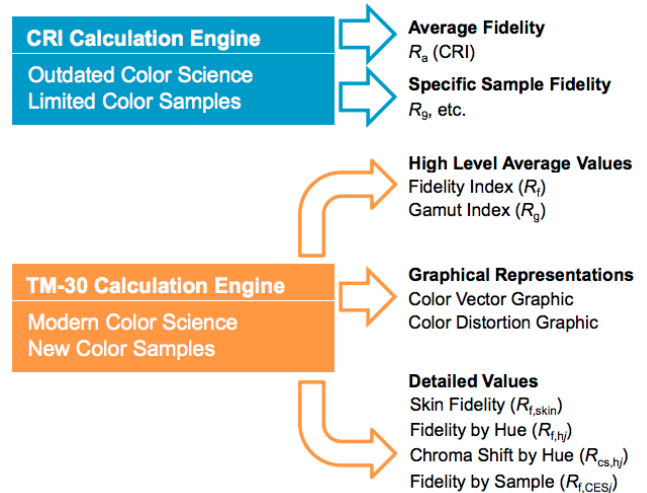
1. **The need for more accurate (i.e. scientific) assessment.** Accuracy of color appearance evaluation arising from the original 1974 CRI formula and the small number of color test samples used in the calculations.
2. **A single metric is not enough to properly describe color by a human observer.** It is a single metric - a color fidelity metric - measuring the color appearance of objects compared to their appearance under defined reference illuminant. However, there are many other color quality characteristics other than color fidelity, including when samples undergo chroma enhancements.

In 2017, CIE published the technical report “CIE 224:2017 Color Fidelity Index for accurate scientific use” which presents a new general color rendering index, Rf, based on the Illuminating Engineering society of North America’s TM-30-15 standard. Dr. Michael Royer summed up the major changes in this slide from his 2016 [AATCC LED Summit presentation](#).

CIE CRI (1965/1974)	IES TM-30-15 (2015)
CIE 1964 U*V*W*	→ CAM02-UCS (CIE CAM02)
8 color samples Medium chroma/lightness Spectral sensitivity varies Munsell samples only	→ 99 color samples Uniform color space coverage Spectral sensitivity neutral Variety of real objects
Ref Illuminant Step Function	→ Ref Illuminant Continuous (Uses same reference sources, but blended between 4500 K and 5500 K)
No lower limit for scores and inconsistent scales	→ 0 to 100 scale (fidelity)

Dr. Michael Royer concluded that, “TM-30 is a tool, not an answer. You must understand it to be able to use it effectively.” Specifically, the calculation engine has changed significantly, as shown in the graphic. In the upcoming months, StellarNet will be sure that the TM-30 calculation engine is available in all relevant products.

The adoption of the general color fidelity index, R_f , as defined by TM-30-15 as a scientifically accurate measure of color fidelity solves only the first identified issue with the original CRI; there is still “the need for perception-related color quality measures beyond fidelity,” Youngshin Kwak, Director of CIE Division 1, wrote in the March/April 2018 issue of LED Professional. The CIE has a second working group working toward developing one or more perception-related color quality measures beyond fidelity. In his AATCC LED Summit presentation in 2016, Dr. Michael Royer concluded with,



**“Color quality is more than just TM 30.
Keep an eye on other metrics.”**

ABOUT STELLARNET

StellarNet, Inc. manufactures precision fiber optic spectrometers for portable and multi-channel industrial applications, which enable low cost spectroscopy solutions. Our expertise in electro-optics, software design, and applications development, provides unmatched price performance in the global instrumentation market.

Watch and Learn!

The US Department of Energy and the Illuminating Society of America put together a [fact sheet](#) and videos to help explain the new IES TM-30-15 method for Evaluating Light Source Color Rendition

Introduction & FAQ TM-30-15

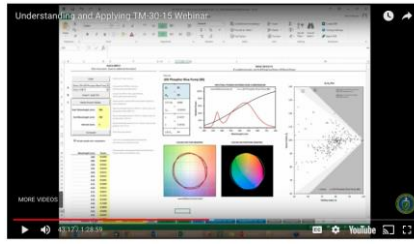
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<https://www.energy.gov/eere/ssl/tm-30-frequently-asked-questions>

Understanding and Applying TM-30-15

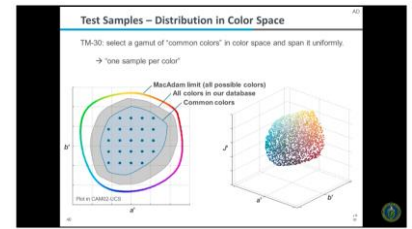
Duration: 1.5 hrs



<https://www.energy.gov/eere/ssl/webinar-understanding-and-applying-tm-30-15>

Technical Discussion of TM-30-15

Duration: 1.5 hrs



<https://www.energy.gov/eere/ssl/downloads/webinar-technical-discussion-tm-30-15>