Alan Lowne, CEO Saelig Co. Inc.

Measuring Single LEDs

Pocket-sized precise LED measurement solution offers laboratory-grade precision

With the advent of high-brightness blue and white LEDs, the market for LED light has been growing exponentially. LEDs are used in displays, illuminated advertisements, lamps, and throughout automobiles. LEDs are found in light fixtures, aircraft, traffic lights, and theater, photographic, and architectural lighting. But is impossible for LEDs to be manufactured with identical spectral properties due to the variations in production processes, physical housings, and operating conditions. Brightness and color peak can vary substantially from component to component even in the same production batch. For critical applications (not merely indicator lights) LEDs need accurate testing methods during manufacture and in final assemblies. Precise optical characterization is also valuable in research situations for LED-based products, or for batching or "binning" LEDs (i.e. selection of color and brightness groups) with nearly-identical characteristics for assembly lines.

Full-color LED displays contain many thousands of LEDs, and their illumination characteristics need to be matched to ensure good color uniformity.

Measuring single LED performance may also be necessary once they have been installed on a PCB. Quality control of incoming LEDs delivered by different suppliers may be needed for binning, or for characterizing fiber optic sources like endoscopes, or even calibrating lighting fixtures made of many LEDs. Other applications for LED testing include investigating the influence of dimming, testing diffusers or optics installed on LEDs, monitoring changes of spectra, color or luminous flux due to current drive, time, or temperature.

Uniform luminance and color in automobile cockpits is also very important, requiring color matching various sub-assemblies and modules from different suppliers. Full-color LED displays contain many thousands of LEDs, and their illumination characteristics need to be matched to ensure good color uniformity. Other applications include LED-based measuring instruments such as blood analyzers that determine blood-sugar concentration. Precise characterization of LEDs in these applications is critical since this affects the life-saving accuracy of the results.

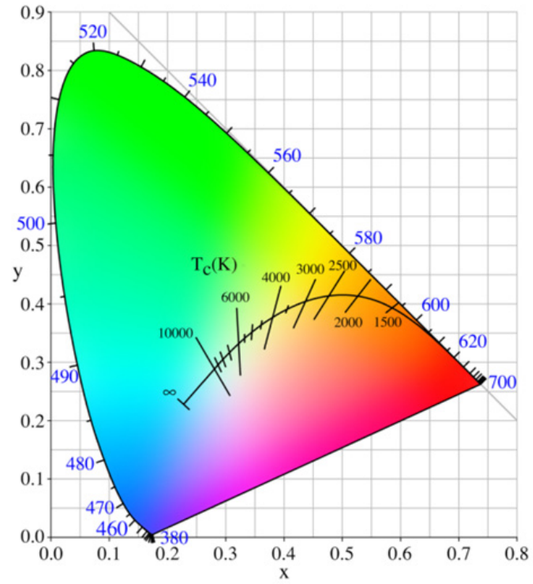
Measurements

Typical measurements can include: Lumens (luminous flux), CCT (correlated color temperature according to CIE standards), CRI (color rendering index according to CIE standards), COLOR (color coordinates according to CIE 1931 and CIE 1964), and mWatt (radiant power value).

One very useful highly portable solution that offers the accuracy of benchtop instruments is the combination of the GL SPECTIS 1.0 and the GL OPTI SPHERE 48. Ready to run within 10 seconds of connecting this handheld plug 'n' play combo to a computer, the system automatically detects which accessories have been attached to it, and it is rapidly ready to perform measurements. Each instrument and accessory is provided with individual instrument calibration comes as standard to ensure that the results produced are correct and reliable. It is a portable solution that can be taken to the production line or packed in a travel bag for field use.

The GL SpectroSoft software included in the package is intuitive, user-friendly, delivers results within seconds, with the ability to easily export or import results or settings. Measurements include: CIE-compatible color coordinates, correlated color temperature, Color Peak, Color dominant, CRI color rendering index, MI metamerism index, color charts according to different CIE standards, etc. By default, this mini-spectrometer measures from 340-750 nm but the range can be reduced for measurements of particular light sources.

The software includes a BIN EDITOR which helps to define a binning set, specifying individual fields on the chart with X Y values. Specific names and X1, Y1 X2, Y2, X3, Y3… values are assigned to these fields, which designate a specific rectangle on the chart. The most critical bin criteria that impact product performance are light output and color temperature. Binning for light output is a very straightforward - LEDs are individually measured and sorted by lumen output into prescribed ranges. Luminaire manufacturers can easily select the bin or bins that best meet the lumen performance requirements of their fixture. Binning for color temperature is a more complex process. Color temperature bins are defined by (x,y) coordinates on the CIE 1931 Chromaticity Diagram (shown at right). These bins are grouped as quadrants around the standard chromaticity lines for a specified color temperature. For more information about color binning, bin sizes and the ANSI C78 377A, see: http://www.nema.org/media/pr/20080221a.cfm.



Summary

GL SPECTIS 1.0 and the GL OPTI SPHERE 48 are a useful tool combination for manufacturers, production environments, field work, as well as laboratories in a range of real-world applications. ■

» CLICK HERE
to comment on the article.