

Metering in the LED Era

By: Richard Cadena

Several years ago (a hundred?), I saw one of my first lighting designs on a video monitor, and it was eye-opening. I had designed a three-point lighting system with warm key light, cool fill light, and cool back light, just as the book said to do. It looked perfectly fine to my eye, but when the cameras were turned on, the colors on the monitor were very different, and the saturation was exaggerated, which made skin tones look completely ridiculous. The subject looked like he was wearing clown makeup. The right half of his face looked red and the left half looked blue, with a distinct line of demarcation down the middle. I was stunned, and nearly died of embarrassment. I got up the ladder as quickly as I could and ripped out the gels before anybody else could see it.

That was my introduction to the difference between the human visual system and a mechanical visual system. They work very differently. That difference seems to be amplified when the light sources are LED rather than natural light or incandescent light. It's the difference between a discontinuous spectrum (like RGB LED) and a continuous spectrum (like natural light or incandescent light). Today, most new luminaires being produced have either an LED or an arc lamp source; both are discontinuous sources, which means that it might be time to look at getting a new light meter.

I've had a Minolta T-10 for years, but I recently acquired an Asensetek Lighting Passport spectrometer at the recommendation of Mike Wood. You may know Mike from his long history in the lighting industry or from his current columns in *Protocol* or *LSA*. Early in his career, he worked for the BBC and also served as president of PLASA before moving to the United States, where he became a vice president of research and development in the early days of High End Systems. Today, he works as a lighting consult-



The Asensetek Lighting Passport light sensor can fit in the palm of your hand and connects through Bluetooth to an app on your smartphone or tablet.

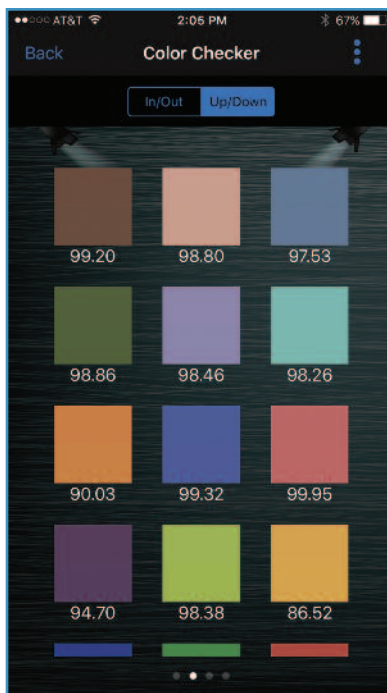
ant and specializes in LED technology and color measurement. Virtually everything I know about light and color measurement (and I still have a lot to learn!) I learned from reading his columns in *Protocol*, which are also archived on his website (www.mike-woodconsulting.com), or by chatting with him (he also happens to live in my south Austin neighborhood). Since this area is rapidly changing, it's a great resource for lighting professionals.

After reading his articles about CRI (color rendering index), CQS (color quality scale), TLCI (television lighting

consistency index), and TM-30-15 (IES Method for Evaluating Light Source Color Rendition), I decided it was time to replace my Minolta, so I purchased a Lighting Passport Essence Pro. Like most professional lighting tools, it was not cheap (\$1,295, plus another \$200 for the Spectrum Genius Studio app that provides the ability to measure TLCI). There are several different models of the Lighting Passport, but this model is the least expensive that still provides TM-30 measurements in addition to CCT, CRI, CQS, illuminance, spectrum diagrams, and, with



The Spectrum Genius Studio app for the Lighting Passport provides information about CCT, illuminance, TLCI, CRI, CQS, and more.



The ColorChecker uses virtual color samples to illustrate the difference between a reference light source and the measured light source.

the SGS app, TLCI.

Besides all of those measurements, it also provides individual measurements for each of the 15 color samples used for CQS, which tells you not only where the source is deficient, but also to what degree it's deficient. And it provides other useful information like flicker percentage, flicker index, flicker frequency, and a lot more. That's all with the standard app.

With the Spectrum Genius Studio app you can also measure white balance and see ColorChecker charts with 24 Q values, and the measurement provides colorist advice in the form of correction for lightness, chroma, and hue for 12 color bands. That's really only scratching the surface of its capabilities, and since I've only had the meter for a few days, I am still exploring the possibilities.

Do you really need all of that information? It depends on what you're doing, but if you're lighting for video or film, it's invaluable information that can

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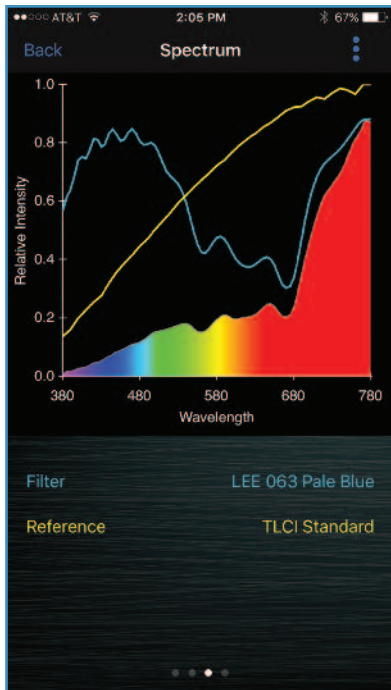
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The spectral power distribution curves illustrate the spectral content of the measured light source compared to a gel-corrected light source and a reference light source.

| Sector | Lightness | Chroma | Hue |
|--------|-----------|--------|-----|
| R | 0 | 0 | 0 |
| R/Y | 0 | 0 | +1 |
| Y | 0 | 0 | +1 |
| Y/G | 0 | 0 | 0 |
| G | 0 | 0 | 0 |
| G/C | 0 | 0 | 0 |
| C | 0 | 0 | 0 |
| C/B | -1 | 0 | +1 |
| B | 0 | 0 | 0 |
| B/M | 0 | 0 | 0 |
| M | 0 | +1 | -1 |
| M/R | 0 | 0 | -1 |

The colorist advice shows the magnitude and direction of suggested camera corrections for lightness, chroma, and hue for 12 color bands.

save you a lot of time and help you capture the best images possible. With the SGS app, you can quickly and easily measure the TLCI, which will give you an indication of how much correction is needed and whether it could even be corrected properly. A TLCI score of 85 to 100 means that errors are small enough that a colorist would probably not correct them; a score of 75 to 85 means that a colorist could probably get acceptable results fairly easily; a score of 50 to 75 means that a colorist could probably get acceptable results but it might take a lot of time; a score of 25 to 50 means that the color rendering is so poor that a good colorist would need to improve it, but there is no guarantee that the results would be up to broadcast standards; and a score of 0 to 25 means that the color rendering is bad, a colorist would probably struggle for a long time to make it acceptable, and even then the results may not be up to broadcast standards.

Even if you're only lighting for a live audience, a good spectrometer can help you figure out how your lighting will render colors before anyone sets foot on stage. It can provide a lot of information beyond the single number CRI provided by so many lighting manufacturers.

The Sekonic C-700 spectrometer is similar in price and features, but since the Lighting Passport is more software-based, it can more easily be updated. It has a separate light sensor and connects to a smartphone or tablet running an app through a Bluetooth connection. The sensor measures about 6.8cm wide by 6.5cm high by 1.6cm thick and easily fits in the palm of your hand. It weighs about 100 grams. If and when there are updates to TLCI or TM-30, then there's a good chance the revisions will be reflected in the app.

My Minolta served me well for many years, but compared to my new spectrometer, it's like an old PAR can next to an automated light. It's time to move on to the new era in light measurement. 📶

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