

# Spectrum Genius Studio - Knowledge

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## WHAT IS "TLCI"?

CRI, the Color Rendering Index is an inadequate gauge of color for solid state lighting [LEDs]. Many other indices have been proposed, such as CQS and GAI but all have flaws, especially when it comes to critical color applications such as lighting for the television broadcast industry.

TLCI, the Television Lighting Consistency Index was developed by Alan Roberts and has become the standard for the European Broadcasting Union [EBU]. TLCI uses a Color Checker [split Macbeth] chart to compare the color rendering qualities of a measured luminaire to a “benchmark” and then assigns a single value between 0 and 100 to the luminaire, the higher the number, the better the color quality.

### The Five Levels of TLCI:

85 to 100	Excellent quality with errors so small that a colorist/lighting engineer/DP may not consider making a correction or making very small adjustments.
75 to 85	A colorist would more than likely make some adjustments to correct color performance, but could easily get an acceptable result.
50 to 75	A colorist/lighting engineer/DP would certainly make adjustments to the camera or use gels to correct for the luminaire’s color deficiencies, and with experience could achieve an acceptable result. This is a time consuming exercise.
25 to 50	The color rendering of the luminaire is poor, requiring the services of an expert colorist/lighting engineer/DP to make significant adjustments and the results would not be to broadcast standard.
0 to 25	The luminaire is a poor choice no matter what adjustments are made to the camera at time of shooting and a colorist/lighting engineer/DP would struggle for a long time adjusting the camera on site and in post production to improve performance. Results would not be acceptable for broadcast.

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## IN TLCI, WHAT DOES THE LETTER PRECEDING CORRELATED COLOR TEMPERATURE [CCT] MEAN??

The letters P, M, and D segment CCT into three classification groups.

P: < 3400 K      M: 3400 ~ 5000 K      D: > 5000 K

Depending on the classification, a different standard of comparison is used to grade the luminaire being measured.

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## WHAT DOES THE BRACKETED NUMBER FOLLOWING CCT MEAN?

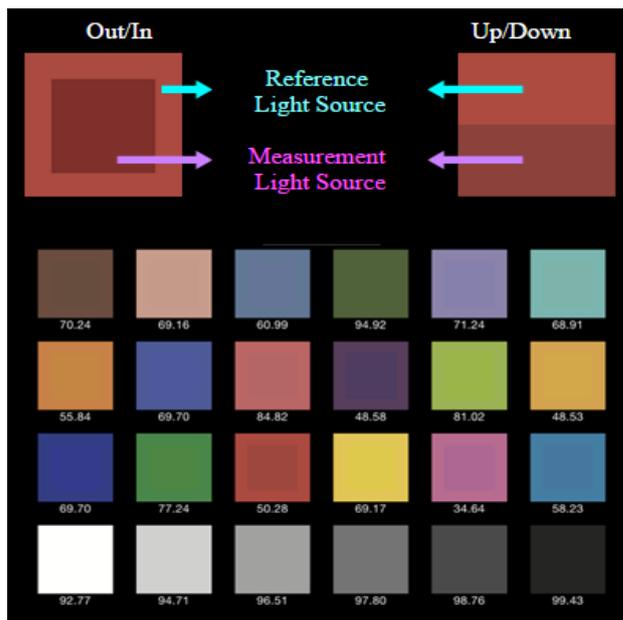
The bracketed number following the measured CCT indicates deviation from the Blackbody curve also known as the Planckian Locus. This number mainly affects hue.

"+" means magenta side,

"-" means green side.

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## WHAT DOES THE COLOR CHECKER CHART TELL US?



A standard TLCI report includes a Color Checker palette, Relative Camera

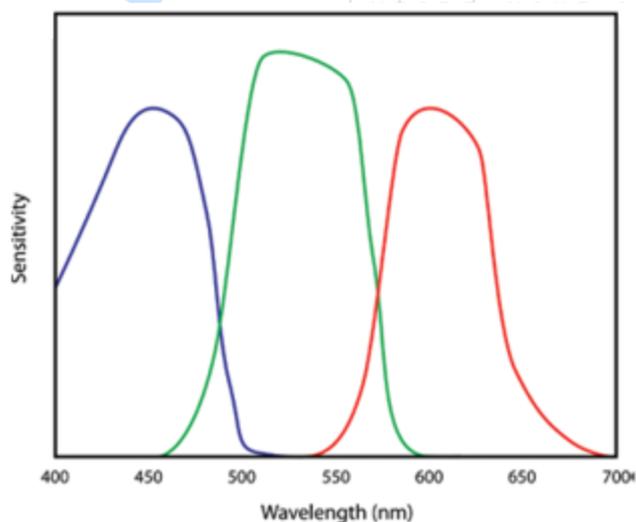
Corrections , and the Spectral Power Distribution of the luminaire as compared to the reference for that CCT range.

If you have a high resolution, calibrated monitor, the Color Checker chart either it's in Up/Down or Out/In display, will visually display the color rendering difference between the Reference Light Source and Measured Light Source.

Because such precise monitors are seldom available, we have added a TLCI number below each color which describes the variance between Reference and Measured light sources for each individual color. This provides the colorist/lighting engineer/DP with better data for making more precise adjustments.

## WHAT DO THE RELATIVE CAMERA CORRECTIONS MEAN?

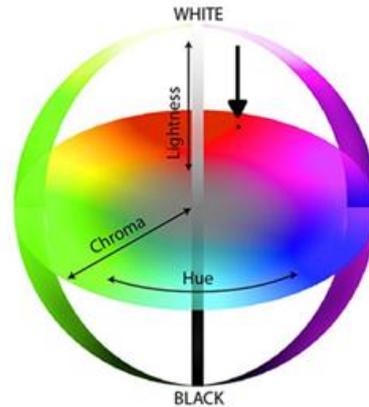
The reference camera used for calculating TLCI has the following spectral response:



The table on the right hand side of the screen shows the magnitude and direction of the camera corrections suggested for Lightness, Chroma, and Hue in each of 12 defined color sectors.

The more adjustments [“+” and “-” signs], the worse the performance and the harder it is to correct. The extremes are +8 and -8

Sector	Lightness	Chroma	Hue
R	-1	0	-1
R/Y	0	0	+2
Y	0	+1	+2
Y/G	0	+1	0
G	0	0	-1
G/C	0	0	0
C	0	0	-2
C/B	-1	0	+2
B	0	+1	+1
B/M	0	0	0
M	0	0	0
M/R	0	0	0



## WHY DO I NEED TO CHECK THE SPECTRAL POWER DISTRIBUTION [SPD]?

The SPD on the lower right side shows the measured light source [in color] versus the ideal reference for the measured CCT range [white]. This gives the colorist/Lighting designer/DP a visual indication of what is missing in terms of radiated light as opposed to the reflected measure shown in the Color Checker chart.

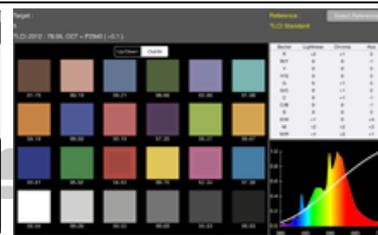
## WHY DOES THE SGS APP ALLOW A USER TO SELECT A DIFFERENT REFERENCE?

SGS automatically selects the standard TLCI reference based on CCT which is displayed in the initial measurement screen. In the top right hand corner of the screen, SGS also allows the user to select a different reference based on an existing benchmark. There is also the option to save a measured luminaire as an additional reference. These references are called Television Luminaire Matching Factors [TLMF] and when selected, all parameters on the screen change to “match” the selected benchmark or saved data. See more in the next section.

## WHAT IS THE TELEVISION LUMINAIRE MATCHING FACTOR [TLMF] AND HOW CAN IT BE USED?

Seasoned Lighting Directors and Directors of Photography find it useful to compare a measured luminaire to a known standard benchmark. That is why they are included in SGS. But what if different luminaires are used to light one scene? This is more often than not the case in live shoots. How then do we “balance” the light? How will the color effect look if the camera is biased for one or the other luminaire? Do they need the same or different correction factors? TLMF, the Television Luminaire Matching Factor, allows a lighting professional to compare two light sources to each other rather than to a standard benchmark, and see how they work together (or not!). Here the use of gels can increase compatibility.

To quote Mike Wood: “If TLCI is a tool for manufacturers to use in designing a product for television use, then TLMF is a tool for practitioners that allows the prediction of real world mixing and matching of different sources before getting in the studio, when it is often too late to change.”

		
<p>Measure the first luminaire and save as a TLMF reference.</p>	<p>Measure the second luminaire</p>	<p>Select the saved TLMF reference and identify critical differences and suggested corrections.</p>

