

Photography/Visibility at Night

Luminosity Function / Incident - Reflected Light

By: R.H. "Bob" Joseph, CLI

It is not always that we go out and think about lighting conditions and why such conditions exist. As photographers, and all investigators are photographers in either still or video photography, it is important to know what the lighting conditions are and what the camera you are using can do under such lighting conditions. All of us know that nighttime photography is more difficult than daytime photo shoots.

In the past the photographer needed to measure the light of the subject, the investigator was about to photograph, and set the camera aperture and shutter speed to compensate for the light that was reflected off the subject. Now-a-days that process is no longer necessary as almost all cameras on the market today are computerized. The light reading, aperture, shutter speed, and even enhancements are made internally and a nice photograph or video is the result. There is one problem, and that is nighttime photography.

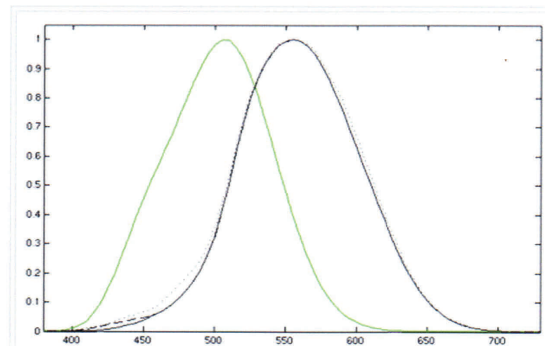
Colors are absent during time of darkness. Sure, there will be some color that is reflected of some illuminated items through artificial lighting. However, total darkness means "all colors are absent". Just go out at night and check your house, your yard, your car and you will find that all you can see are shades of gray. That is because "color" is not perceived. Sure, the color is still there but without light you can not see it. Lighter colors will be lighter gray and darker colors will be dark gray to almost black.

How do you overcome this problem that you have now with the modern camera? If you use a flash unit, or other artificial light, then the scene will be lit up and color is visible. But, that is not really what the scene looks like at night, especially if you must document the scene of a crime, or a pedestrian slip and fall accident. The proper way to document night time scenes is by using Black & White photography or set the shutter speed to Bulb. Most modern cameras have the option to use that feature.

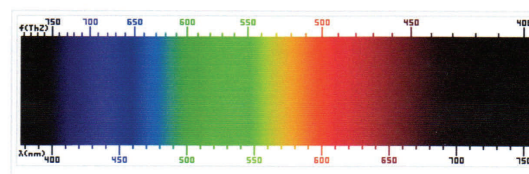
When using the B&W setting on your camera and you want to document the night time scene then you must also use a tripod to eliminate any camera shake due to the fact that the exposure time will be longer than .125 or .6 seconds. There are some exceptions. When the night time scene is pretty well illuminated by store front lights,

street lights and other artificial lighting, then the image may be made in color. However, you may still need to use a tripod to hold the camera steady as it will certainly take longer to make a proper exposure for that perfect rendering of the scene.

Now, having said all of that it is important to document any light that falls on the subject matter (**incident light**) as well as any light that reflects of the subject (**reflected light**). Some say that the light that strikes a subject is reflected back the same way. Yes it is. However, the subject itself - let's say a reflective tape, or a yellow vest - will reflect the light better as compared to a dark sweater or a pair of blue jeans. This is called the **luminosity function**. By definition the luminosity function or luminous efficiency describes the average visual sensitivity of the human eye to light of different wavelengths. For every day light levels the photopic luminosity function best approximates the response of the human eye. For low light levels, the response to the human eye changes and the so called "**scotopic**" curve" applies.



Photopic (black) and scotopic (green) luminosity functions.^[c1] The photopic includes the CIE 1931 standard^[c2] (solid), the Judd-Vos 1978 modified data^[c3] (dashed), and the Sharpe, Stockman, Jagla & Jägle 2005 data^[c4] (dotted). The horizontal axis is wavelength in nm.



Photopic (black) and scotopic (green) luminosity function

Another good example of reflectivity is found in everyday driving. All of us have experience the “not really visible” old and faded stop sign at night visible with your headlights on. The reflectivity of the sign is diminished due to its age and surface “corrosion”, for lack of a better word.

Now go down the road at night, again with your headlights on after the stop sign was changed to one of those new reflective ones. You can really see it well and from a longer distance. Now, what has changed? The sign received the same amount of light, it is the same size and shape! What has changed? The reflectivity of the sign’s surface has changed and the light is now reflected back to your eyes a lot stronger than the old sign’s reflectivity .



Walk - Day



Walk - Night

Having said all this it is important that a night time photograph will most likely be a photograph that is made with a tripod and longer than normal exposure. The investigator must check the camera display screen after each exposure to check if the exposure most closely

looks like the scene. There may be only one proper exposure that is usable in a court of law.

Another inherent problem for the investigator is the printing of the B&W photograph. The printer may not print the photo exactly as it should look, therefore making the print unusable. I have found that the best likeness is represented by using the image with Power Point.



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