



Measuring illuminance with an luminance meter

In principle any reflecting surface is showing an image of the surroundings in front of the surface. The image can be dark or bright depending on the reflectance (ρ) of the surface.

The image quality depends on the type of reflection. If the surface is a mirror it will show a very good image of the surroundings where information of directions is preserved, but if the surface is diffuse (Lambertian) the image is so poor that any directional information is lost. This, in particular, means that the surface luminance is independent of the observation angle.

From basic lighting technology we know that the luminance of a diffuse surface is independent of observation angle and has the value of the surface illuminance, E , reduced by the reflection, ρ , and divided by π .

We have $L = E \times \rho / \pi$ or $E = L \times \pi / \rho$, and it is seen to be very simple to calculate illuminance, of diffuse surfaces, from luminance. If the reflection, ρ , is known with good accuracy, there will be very little or no loss of accuracy using ICAM instead of luxmeters. If a good luxmeter is available then the coefficient π / ρ can be measured by ICAM.

If the surface is not diffusing, either a detailed description of the surface reflection properties is needed or some sort of calibration has to be performed.

If the description of the reflection properties is available, it is fairly simple to find expression to convert luminance into illuminance. The illuminance will be a function of the measured luminance and of the reflection properties for the direction in question. The reflection properties can be a function of directionality of both the incoming light and of the reflected light.

If the luminances are measured with ICAM it is possible to automatically extract the needed directional information. The position of ICAM is not critically and hence a high reproducibility can be achieved.

If there is no description of the reflection properties a calibration is needed. With a **good** luxmeter the illuminance must be measured in several positions. Then luminance is measured in the same positions and from this the luminance coefficients can be calculated. With this approach great care shall be taken with respect to positioning of ICAM. The bigger deviation of the reflection properties from diffuse, the greater care shall be taken.

The best approach is to use a very diffuse surface. A surface with some texture and/or painted with mat and bright paint. The paint might be grinded to a very mat finish. Directions where mirror reflections can occur shall be carefully examined or preferably avoided.