All photometric quantities used by the lighting industry are based on the CIE Standard Photopic Observer, i.e. photopic vision. Therefore, it should not come as a surprise when light sources with different spectral content do not have the same effects when used to provide mesopic vision despite being matched photometrically.

2.2.3 Accommodation

There are three optical components involved in the ability of the eye to focus an image on the retina, the thin film of tears on the cornea, the cornea itself, and the crystalline lens. The ciliary muscles have the ability to change the curvature of the lens and thereby adjust the power of the eye's optical system in response to changing target distances; this change in optical power is called accommodation.

Accommodation is a continuous process, even when fixating, and is always a response to an image of the target located on or near the fovea rather than in the periphery of the retina. Any condition that handicaps the fovea, such as a low light level, will adversely affect accommodative ability. As adaptation luminance decreases below 0.03 cd/m^2, the range of accommodation narrows so that it becomes increasingly difficult to focus objects near and far from the observer. When there is no stimulus for accommodation, as in complete darkness or in a uniform luminance visual field such as occurs in a dense fog, the visual system typically accommodates to approximately 70 cm away.

2.3 Capabilities of the visual system

The human visual system has a limited range of capabilities. These limits, conventionally called thresholds, are mainly of interest for determining what will not be seen rather than how well something will be seen. For the threshold measurements shown here the observers were all fully adapted, the target was presented on a field of uniform luminance and the observers' accommodation was correct.

2.3.1 Threshold measures

The threshold capabilities of the human visual system can conveniently be divided into spatial, temporal and colour classes.

Spatial threshold measures

Spatial threshold measures relate to the ability to detect a target against a background or to resolve detail within a target. Common spatial threshold measures are threshold luminance contrast and visual acuity.

The luminance contrast of a target quantifies its visibility relative to its immediate background. The higher is the luminance contrast, the easier it is to detect the target. There are three different forms of luminance contrast. For uniform targets seen against a uniform background, luminance contrast is defined as

$$C = \frac{|L_t - L_b|}{L_b}$$

where: C = luminance contrast
L_b = luminance of the background
L_t = luminance of the target