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Optical Specifications

Wavefront Distortion

Sometimes the best specification for an optical component is its effect on the emergent wavefront. This is particularly true for optical flats, collimation lenses, mirrors, and retroreflectors where the presumed effect of the element is to transmit or reflect the wavefront without changing its shape. Wavefront distortion is often characterized by the peak-to-valley deformation of the emergent wavefront from its intended shape. Specifications are normally quoted in fractions of a wavelength.

[Interferometer Measurements](#)

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Consider a perfectly plane, monochromatic wavefront, incident at an angle normal to the face of a window. Deviation from perfect surface flatness, as well as inhomogeneity of the bulk material refractive index of the window, will cause a deformation of the transmitted wavefront away from the ideal plane wave. In a retroreflector, each of the faces plus the material will affect the emergent wavefront. Consequently, any reflecting or refracting element can be characterized by the distortions imparted to a perfect incident wavefront.

In the following sections we will look at two methods of measuring the performance of optics. Interferometer measurements actually measure the mechanical deviations of the optic being tested from that of a reference plate or surface. The modulation transfer function (MTF) measures the ability of a lens or system to transfer object contrast to the image and provides a quantitative measure of image quality which is far superior to any classic resolution criteria.

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