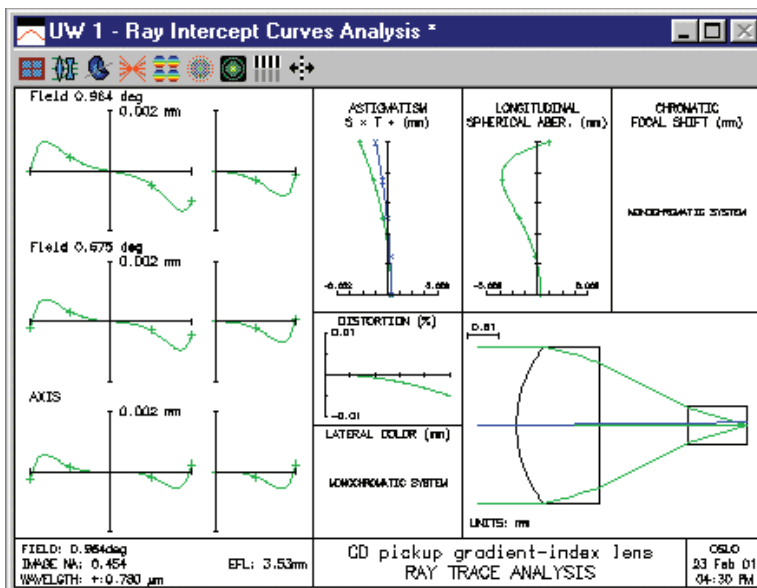# Gradient index

Gradient-lens for a CD pickup

Gradient-index technology has been applied to several diverse application areas. One of the common ones is in consumer optics, where small gradient lenses or arrays of gradient lenses are used in CD-ROMS and copiers. The lens shown here was designed by Nishi and Tayuma at Nippon Sheet Glass (NSG), manufacturer of gradient lenses known by the trademark Selfoc.

In connection with Selfoc lenses, it is worth noting that although NSG makes the paraxial data for their lenses available to the public, the actual data describing the real index distributions has not been published. The data for the index distributions used in this lens do not necessarily coincide with that for commercial Selfoc lenses. The lens is included here to show an example of how it can be entered into OSLO, as well as to assess the general performance level that might be expected from a GRIN lens of this type.

In the drawing shown below, the block on the right is an optical disc. In analyzing this system, please recall that since the standard paraxial trace does not handle gradient index materials, you must use the *pxc and *pxt commands to obtain paraxial data.

Gradient index rod

As noted before, gradient index technology is used in many diverse applications. The system in this example is a gradient index rod that is more like a fiber than a lens. It is, however, an imaginary system, designed using OSLO without regard for actual refractive indices that can be manufactured.
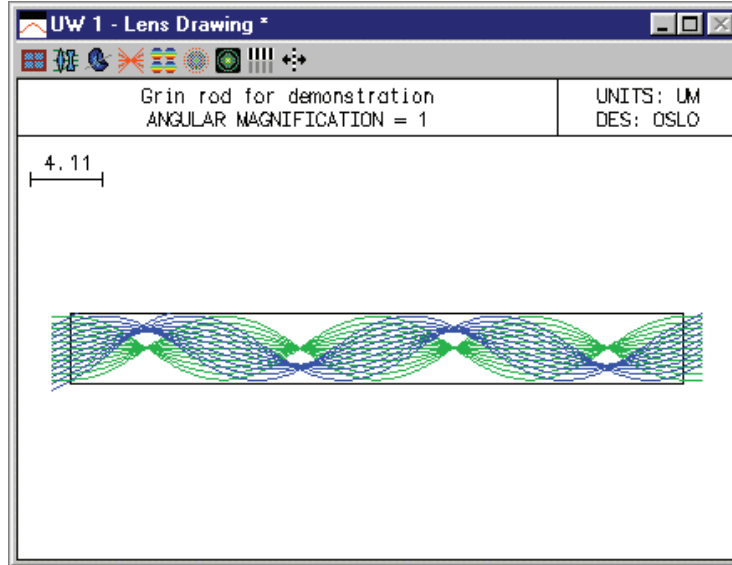
The drawing above shows both on-axis and off axis beams. Note that the off-axis beam for both the upper and lower rim rays is truncated by the edge of the rod. In order for this to happen, you must turn on the Aperture check all GRIN segs general operating condition. If you don't, the rays will be free to propagate outside the boundary defined by the aperture on the surface for with the GRIN material is defined.