Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Analysis of the diffraction properties of volume holograms written with spherical object beams MICHAEL ERMOLD, ADAM FONTECCHIO, Drexel University — Currently, large area primary mirror technology relies on thin layers of metal to serve as the reflecting surface for light collection. As these mirrors become large, they suffer from structural instabilities requiring complex and expensive support systems to maintain excellent reflected wavefront quality. Thin film holographic optical elements (HOEs) present a unique advantage over traditional optics. Holographic thin films are lightweight and are recorded in a one step process. A large range of focal length mirrors can be realized in these devices; however we expect that the reflected wavefront quality is ultimately limited by the optics used to record the holograms. In lieu of the inherent limitations, our analysis will consist of holograms written with idealized recording wavefronts. These holograms are typically formed by a planar reference beam interfering with a spherical object wave. A closed form function for the volume refractive index modulation for these phase gratings is also derived. Diffraction theory is applied and the diffracted field expression is derived. Through this analysis we are able to describe the spectral response, diffraction efficiency, focusing and imaging properties.

Michael Ermold
Drexel University

Date submitted: 07 Dec 2004 Electronic form version 1.4