

Spherical beam volume holograms for spectroscopic applications: modeling and implementation

Omid Momtahan, Chao Ray Hsieh, Arash Karbaschi, Ali Adibi, Michael E. Sullivan, and David J. Brady

The spherical beam volume hologram, recorded by a plane wave and a spherical beam, is investigated for spectroscopic applications in detail. It is shown that both the diffracted and the transmitted beam can be used for spectroscopy when the hologram is read with a collimated beam. A new method is introduced and used for analysis of the spherical beam volume hologram that can be extended for analysis of arbitrary holograms. Experimental results are consistent with the theoretical study. It is shown that the spherical beam volume hologram can be used in a compact spectroscopic configuration when the transmitted beam is monitored. Also, on the basis of the properties of the spherical beam hologram, the response of a hologram recorded by a plane wave and an arbitrary pattern is predicted. The information can be used to optimize holographic spectrometer design. © 2004 Optical Society of America
OCIS codes: 060.7330, 300.6190, 070.2590.

20 December 2004 _ Vol. 43, No. 36 _ APPLIED OPTICS