Book of Abstracts

1st International Meeting on Applied
Physics

APHYS-2003

Badajoz, Spain. October 13-18th 2003

<http://www.formatex.org/aphys2003/aphys2003.htm>

ANALYSIS OF SECOND AND THIRD DIFFRACTED ORDERS IN VOLUME DIFFRACTION GRATINGS RECORDED ON PHOTOPOLYMERS

S. GALLEGO, M. ORTUÑO AND I. PASCUAL

Dept. Interuniversitario de Óptica, Universidad de Alicante, Ap. 99, E03080 Alicante, SPAIN

C. NEIPP, A. MÁRQUEZ AND A. BELÉNDEZ

Dept. de Física, Ingeniería de Sistemas y Teoría de la Señal, Univ. Alicante, Ap. 99, E03080 Alicante, SPAIN

In order to characterise holographic volume transmission gratings the angular responses of the transmittance and first diffracted order are usually evaluated. Provided a sinusoidal diffraction grating is recorded on the hologram and the volume parameter, Q , is high enough, Kogelnik's Theory has demonstrated to be highly predictive. Nevertheless, this Theory fails when higher orders than +1 propagate in the hologram (provided these orders has sufficient energy). In this work we will give experimental evidence of the propagation of higher orders in holographic transmission gratings recorded on PVA/acrylamide based photopolymers. Second orders has been observed for transmission holograms recorded with a spatial frequency of 1125 lines/mm, with a value of the parameter Q of ~ 100 , provided the index modulation is high enough. Apart from second orders, third orders were also observed for transmission gratings recorded with a spatial frequency of 550 lines/mm, the Q -parameter was calculated as ~ 50 in this case. Since Kogelnik's Theory is not applicable the theoretical support to the experimental data was given by the rigorous coupled-wave analysis (RCW) proposed by Moharam and Gaylord. Good agreement between the theoretical fits and the experimental data was found.

TOPICS + KEYWORDS: Holography, Optical Storage, Volume holograms, Diffraction gratings, Photopolymers.