Abstract book of the 11th Iberoamerican Optics Meeting/14th Latinamerican Meeting on Optics, Lasers and Applications, RIAO/OPTILAS 2023, San José, Costa Rica, Marzo 27-31, 2023.

Noise gratings in holographic waveguides recorded in photopolymers

Juan Carlos Bravo, Cristian Neipp, Joan Sirvent, Jaume Colomina, Andrés Márquez, Jorge Francés, Sergi Gallego and Augusto Beléndez

I.U. Física Aplicada a las Ciencias y las Tecnologías, Universidad de Alicante, P.O. Box 99, E-03080 Alicante, Spain;

cristian@ua.es

Abstract. It is a fact that augmented reality or virtual reality has burst into society with force: allowing the creation of programmed video games to be played with virtual reality glasses or the manufacture of glasses that act as mobile devices connected to the Internet ("Google glasses"). Augmented reality devices generally consist of a headset and a display system to show the user virtual information in addition to the real one. The systems used are the transparent optical screen and the mixed video screen. In this way, virtual images can be used that are shown to the user, mixed with reality or projected directly on the screen. On the other hand, the "glasses" have some advantages in relation to a direct viewing mobile screen, for example, hands-free and high privacy character. Among the different models of glasses proposed, transparent glasses are especially important for mobile use because they are safer and easier for the public to accept. However, combining high-quality images with clear visibility throughout the system remains a challenge. In this work, holographic waveguides will be manufactured in photopolymers and the experimental results will be contrasted with the numerical simulations carried out using the RCW models. An important fact that must be taken into account in the recording of the holographic waveguide is the possible recording of noise reflection gratings. In general, noise gratings in other devices extract a small amount of energy from the diffracted order, without any other spurious effects. However, in this particular device it will be shown that noise reflection gratings could create an unwanted afterimage. Since the reconstruction is performed at a different wavelength than the recording, the reflection noise grating may or may not be "visible" during the reconstruction, so it is possible to control the appearance of the gratings, for example, by controlling the thickness of the final waveguide. The gratings to performed the study were recorded using an HPDLC photopolymer as recording medium. To understand the capabilities of this material for this particular application, inclined transmission holographic gratings with spatial frequencies of 1690 lines/mm were recorded and analysed.

Keywords: photopolymers; diffraction gratings; holographic waveguide; holography

Acknowledgements: This research was funded by "Generalitat Valenciana" (Spain) (DIFEDER/2021/014, cofunded by EU through FEDER Programme; and PROMETEO/2021/006) and “Ministerio de Ciencia e Innovación” (Spain) (PID2021-123124OB-I00.