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Photorefractive laser beam modulator

R. MÜLLER, J.V. ALVAREZ, L. ARIZMENDI and J.M. CABRERA

Universidad Autónoma de Madrid, Depto. Física de Materiales C-IV, Canto Blanco, 28049 Madrid, Spain

A new laser beam modulator is demonstrated using both photorefractive and piezoelectric properties of LiNbO_3 . It is based on a narrow bandwidth Bragg reflector interference filter previously developed in LiNbO_3 by photorefractive fixing of a volume hologram. The filter performances for a 2 mm thick plate and a writing wavelength of 514.5 nm are the following: a FWHM bandwidth of 50 pm, a peak reflectivity of 32.5% and an angular field of view of 4° at a peak wavelength of 518.45 nm. The peak wavelength of the Bragg reflector can be tuned by applying an electric field to the large plate surfaces. By piezoelectric effect the period of the hologram grating can be changed so that the Bragg angle is also varied. This allows a peak tunability of about 10 pm/kV which corresponds to about a quarter of FWHM per kilovolt. Temperature can also be used in the same way giving a tunability of about 2.5 pm/K. By applying an AC electric field the on/off-Bragg condition produces a modulating effect on the reflected beam. A modulation depth of about 80% has been demonstrated using a ± 2 kV voltage on our sample. Further improvements in the fabrication procedure of the filter and the optimization of the geometry of the sample are expected to increase the modulation capabilities and reduce the required voltage.