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Direct writing of functional ferroelectric waveguides in glass CARL LIEBIG, JONATHAN GOLDSTEIN, GARY COOK, Air Force Research Laboratories — Femtosecond lasers modify the refractive index of many transparent materials for writing high quality waveguides due to their ability to confine the optical damage to an intended region [1]. They also can precipitate microcrystalline structures in glass and have demonstrated the production of ferroelectric crystals that can be used for optical waveguiding [2,3]. Ferroelectric crystals such as lithium niobate are some of the most widely used optical materials due to their strong electro-optic, piezoelectric, and photorefractive properties. The structure and alignment of the precipitated ferroelectric crystals can be controlled through the incident beam profile, writing speed and the starting material composition[2]. In this study crystalline waveguide structures were be written in $33LiO_2$-33Nb2O_5-34SiO_2 (mol%) glass, characterized, the structural orientation determined, and their waveguiding performance tested. This procedure was then modified to functionalize the precipitated waveguides for photonic and holographic applications. [1] C. Mauclair et al., Opt. Exp. 16, (2008). [2] A. Stone et al., Sci. Reports **5**, 10391 (2015). [3] T. Komatsu et al., J. Sol. State Chem. 184, 411 (2011).

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