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Dispersive properties of small polaron-based hologram recording in nominally undoped, thermally reduced $LiNbO_3$[1] HAUKE BRUENING, MIRCO IMLAU, Department of Physics, University of Osnabrueck, Germany — We recently discovered a new type of hologram recording in nominally undoped, thermally reduced $LiNbO_3$ by means of a single intense ns-laser pulse ($\lambda = 532\,\mathrm{nm}$) yielding short-lived volume phase-gratings with unique features [1]: a diffraction efficiency of more than 20% in the NIR spectral range ($\lambda = 785\,\mathrm{nm}$), a stretched-exponential relaxation behavior of the grating efficiency with a lifetime in the ms-range at room temperature and a pronounced dependence on the orientation of the grating vector with respect to the polar c-axis. This type of hologram recording could be successfully modeled by taking into account an optically generated spatial modulation of small electron bipolarons, small bound and free electron polarons. In this contribution we face the unique dispersive properties of this type of hologram recording and particularly present our results for probing light in the blue-green spectral range ($\lambda = 488$ nm). We show that the further contribution of small bound hole polarons must be taken into account. Furthermore, we conclude that a considerable diffraction efficiency at the telecommunication wavelength ($\lambda = 1550$ nm) can be expected.

[1] M. Imlau et al., Optics Express 19, 15322 (2011)

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