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Main photorefractive Fe center in $KNbO_3$ SERGEY BASUN, DEAN EVANS, Air Force Research Laboratory — $KNbO_3$ crystals have been attracting a lot of interest in nonlinear optics. In iron-doped samples, a dramatic increase in photorefractive sensitivity and speed can be achieved. Despite the variety of Fe centers known in $KNbO_3$:Fe, the Fe center responsible for the photorefractive effect has not been previously identified. Correlated EPR and optical studies of the as-grown and reduced samples shed light on the nature of the main photorefractive center in $KNbO_3$:Fe – it is Fe[Nb]-V_O, Fe on the Nb site next to oxygen vacancy. Fe[Nb] centers that are commonly considered as the cause of photorefraction in $KNbO_3$:Fe are only of secondary significance. Free electrons are provided through photoionization of Fe^{2+}[Nb]-V_O with photon energies higher than 0.85 eV, Fe^{3+}[Nb]-V_O centers serve as electron traps. Concentration of the Fe[Nb]-V_O centers is quite comparable to that of Fe[Nb], but in the as-grown samples they are only present in the form of Fe^{3+}[Nb]-V_O. Reduction of the samples takes almost no effect on Fe^{3+}[Nb], but it appreciably converts Fe^{3+}[Nb]-V_O to Fe^{2+}[Nb]-V_O, which gives rise to the concentration of the photo-electron donors and dramatically improves photorefractive performance. Locations of the $Fe^{2+/3+}$[Nb]-V_O and $Fe^{3+/4+}$[Nb] centers in the bandgap will be presented.

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