2.4 Photorefractive Effects in the Ultraviolet

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Previous experiments have demonstrated that holographic gratings can be written in pure $KNbO_3$ crystals with UV light (λ~340-360 nm) making use of the direct interband photoexitation of electron-hole pairs. Because of the large resonant absorption in this frequency range, interband photorefractive gratings are formed only in a thin layer (thickness of 20- 200 μm for a recording intensity of 20 mW/cm^2) close to the surface. The gratings are robust, meaning that they are not influenced by intense beams at longer wavelengths, and their build-up times are of the order of μs, which is 10 times faster than the fastest effect measured in the visible range. All these properties make this kind of effect attractive for photorefractive beam steering applications, fast optical spatial modulators and correlators. The theoretical model which describes the band-to-band photoexitation and recombination in the rate equations was numerically solved for two limiting cases in the steady state. The present work is devoted to the measurement of the energy beam coupling and the rise-time of the grating as a function of the light intensity. The aim is to obtain further information about several free parameters involved in the model so that our understanding of the process can be extended not only in the limiting cases, but also for more general situations.