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Interacting drift-diffusion theory for photoexcited electron-hole gratings in semiconductor quantum wells¹ KA SHEN, GIOVANNI VIGNALE, University of Missouri-Columbia — Phase-resolved transient grating spectroscopy in semiconductor quantum wells has been shown to be a powerful technique for measuring such an elusive quantity as the electron-hole drag resistivity ρ_{eh} , which depends on the Coulomb interaction between the carriers. In this paper we develop the interacting drift-diffusion theory, from which ρ_{eh} can be determined, given the measured mobility of an electron-hole grating. From this theory we predict a crossover from a high-excitation-density regime, in which the mobility has the “normal” positive value, to a low-density regime, in which Coulomb-drag dominates and the mobility becomes negative. At the crossover point, the mobility of the grating vanishes.

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