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Title

THz-driven quantum wells: Coulomb interactions and Stark shifts in the ultrastrong coupling regime

Source

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Abstract

We investigate the near infrared interband absorption of semiconductor quantum wells driven by intense terahertz (THz) radiation in the regime of ultrastrong coupling, where the Rabi frequency is a significant fraction of the frequency of the strongly driven transition. With the driving frequency tuned just below the lowest frequency transition between valence subbands, a particularly interesting phenomenon is observed. As the THz power increases, a new peak emerges above the frequency of the undriven exciton peak, which grows and eventually becomes the larger of the two. This reversal of relative peak intensity is inconsistent with the Autler-Townes effect in a three-state system while within the rotating wave approximation (RWA). In the samples investigated, the Bloch-Siegert shift (associated with abandoning the RWA), exciton binding energy, the Rabi energy, and non-resonant ac Stark effects are all of comparable magnitude. Solution of a semiconductor Bloch model with one conduction and multiple valence subbands indicates that the ac Stark effect is predominantly responsible for the observed phenomenon. (39 References).