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Optical coupling and parametric sideband generation in a semiconductor bound exciton RENUKA RAJAPAKSE, SUSANNE YELIN, University of Connecticut — Group theoretical techniques are used to deduce the selection rules and energy splitting of the electric dipole absorption lines $\Gamma_6 \rightarrow \Gamma_8$, $\Gamma_7 \rightarrow \Gamma_8$ of a donor exciton in a tetrahedral semiconductor, e.g., GaAs. We obtain selection rules for the above transitions for the spin states Δm_j. The application in a bound exciton system in a magnetic field for the purposes of obtaining electromagnetically induced transparency is discussed. In particular, Stokes and Anti Stokes couplings have been experimentally observed in such a system. We theoretically calculate the expected gains of the Stokes and anti Stokes couplings for σ- and π- polarization of the pump field. We show that the system can be interpreted as one exhibiting double Λ-type transitions, and therefore could be used for coherent non-linear optics and, ultimately, quantum-optics based quantum information processing.

Susanne Yelin
University of connecticut

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