Landé $g$ factors and orbital angular momentum quenching in semiconductor quantum dots

CRAIG E. PRYOR, MICHAEL E. FLATTÉ, Physics Dept., University of Iowa — We present calculations of $g$-factors for nanocrystal and self-assembled quantum dots. We find that in addition to the effects of dot geometry and strain, quantization quenches the orbital angular momentum of the dot states, pushing the electron $g$ factor towards 2 even when all the semiconductor constituents of the dot have negative $g$ factors. This leads to trends in the dot’s electron $g$ factors that are the opposite of those expected from the effective $g$ factors of the dot and barrier material. Both electron and hole $g$ factors are strongly dependent on the magnetic field orientation; hole $g$ factors for InAs/GaAs quantum dots have large positive values along the growth direction and small negative values in-plane. The approximate shape of a quantum dot can be determined from measurements of this $g$ factor asymmetry. This work was supported by DARPA/ARO DAAD19-01-1-0490.