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Electronic states in InGaAs/GaAs asymmetric quantum rings[1]
VIVALDO LOPES-OLIVEIRA, Ohio University, Universidade Federal de São Carlos, VICTOR LOPEZ-RICHARD, Universidade Federal de São Carlos, SERGIO ULLOA, Ohio University — Semiconductor quantum rings (QRs) have attracted a great deal of attention due to the interesting multiply-connected geometry they provide for charge carriers. The observation of Aharonov-Bohm [1] effects on the excitonic response in this geometry and the appearance of localized defects during the growth processes call for theoretical studies of the impact of defects on the optical response in magnetic fields. We present here systematic studies of asymmetry in QRs under magnetic fields within a k.p formalism. Different kinds of perturbations are studied, as the model used allows modulation of confinement and perturbation strength. The angular momentum hybridization is characterized for different field intensity and confinement/defect shape. The coupling of unperturbed and symmetric states defines the potential appearance of crossings and new anticrossings in the electronic structure as function of field and structural parameters. The electronic orbitals are contrasted with unperturbed states and the effects on the optical response for inter-subband transitions are discussed as signatures of symmetry breakings.

[1] M.D.Teodoro et al. PRL 104, 086401 (2010).

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