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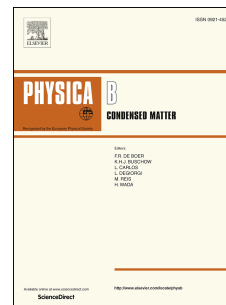
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## On the eccentricity effects on the intraband optical transitions in two dimensional quantum rings with and without donor impurity

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### Abstract

Using the plane wave expansion in the frame of the effective mass approximation, a straightforward method is presented to calculate the energy levels and the corresponding wavefunctions in a two dimensional GaAs/Al<sub>x</sub>Ga<sub>1-x</sub>As eccentric quantum rings (QRs) with and without donor impurity. The transition energy and their related optical absorption coefficients are calculated. The obtained results show that the transition energy between the ground state and the first two excited states and their related optical matrix are strongly influenced by the eccentricity and the donor position. The resonant peaks of the absorption coefficients for electron are blueshifted, while for QRs with an off center impurity the resonant peaks are red or blueshifted depending on the donor positions and eccentricity. In addition, we have found that a small eccentricity acts on the QRs qualitatively as a weak radial electric field. Moreover, an electric field is no longer able to reproduce perfectly the eccentricity effect when the eccentricity becomes relatively strong. Finally, our results are qualitatively similar to those reported in recent works dealing with concentric QRs under a radial electric field.

**Keywords:** quantum ring, eccentricity, effective mass approximation, intraband optical absorptions, donor impurity

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