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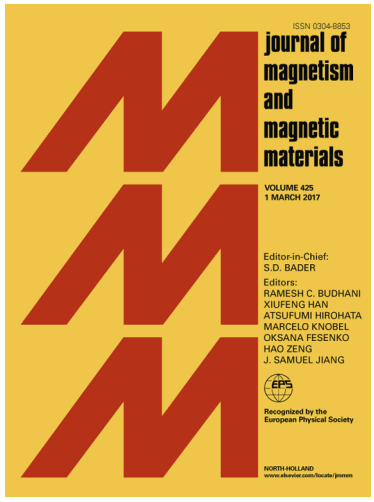

Research articles

Simultaneous effects of electron-electron interactions, Rashba spin-orbit interaction and magnetic field on susceptibility of quantum dots

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Simultaneous effects of electron-electron interactions, Rashba spin-orbit interaction and magnetic field on susceptibility of quantum dots

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Abstract

In this work, we have theoretically studied susceptibility of an InAs quantum dot in the presence of Rashba spin-orbit interaction (SOI), electron-electron (e^--e^-) interaction, and magnetic field. We have used two potential models, shifted parabolic and inverse lateral shifted parabolic potentials. We have first solved the Schrodinger equation to obtain energy levels and then obtain the susceptibility using canonical ensemble. It is found that the susceptibility at low magnetic field is negative and then it becomes positive with increasing the magnetic field. This transition occurs at a particular magnetic field. The transition diamagnetism to paramagnetism occurs at lower magnetic field when the temperature increases. The susceptibility reduces with increasing temperature without considering the Rashba SOI. With considering e^--e^- interaction, the peak position of susceptibility shifts toward lower magnetic fields. Also, the temperature has an effect on width and height of susceptibility.

Keywords: Susceptibility, Rashba spin-orbit interaction, Quantum dot

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