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标题: Nonadiabatic generation of spin currents in a quantum ring with Rashba and Dresselhaus spin-orbit interactions

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摘要: When subjected to a linearly polarized terahertz pulse, a mesoscopic ring endowed with spin-orbit interaction (SOT) of the Rashba-Dresselhaus type exhibits non-uniform azimuthal charge and spin distributions. Both types of SOT couplings are considered linear in the electron momentum. Our results are obtained within a formalism based on the equation of motion satisfied by the density operator which is solved numerically for different values of the angle 0, the angle determining the polarization direction of the laser pulse. Solutions thus obtained are later employed in determining the time-dependent charge and spin currents, whose values are calculated in the stationary limit. Both these currents exhibit an oscillatory behavior complicated in the case of the spin current by a beating pattern. We explain this occurrence on account of the two spin-orbit interactions which force the electron spin to oscillate between the two spin quantization axes corresponding to Rashba and Dresselhaus interactions. The oscillation frequencies are explained using the single particle spectrum.

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