

Persistent current and quantum phase transition in mesoscopic Rashba rings

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Theoretically studying the Rashba mesoscopic ring, we give the persistent charge and spin currents (PCC and PSC) and find the existence of several quantum phases in the ground state, the orbital magnetic phase (OMP), non-OMP, pseudo-OMP and quasi-OMP, which depend on the spin-orbit interaction (SOI) strength, the electron number in the ring and the ring size. We also give the phase diagram in the parameter space and their quantum-phase-transition conditions. These results provide a physical insight to understand the physics of the Rashba mesoscopic ring and some hints to realize robust spin coherent states.