

Quantum Physics

Induced Fractional Zero-Point Angular Momentum for Charged Particles of the Bohm-Aharonov System by means of a "Spectator" Magnetic Field

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An induced fractional zero-point angular momentum of charged particles by the Bohm-Aharonov (B-A) vector potential is realized via a modified combined trap. It explores a "spectator" mechanism in this type of quantum effects: In the limit of the kinetic energy approaching one of its eigenvalues the B-A vector potential alone cannot induce a fractional zero-point angular momentum at quantum mechanical level in the B-A magnetic field-free region; But when there is a "spectator" magnetic field the B-A vector potential induces a fractional zero-point angular momentum. The "spectator" does not contribute to such a fractional angular momentum, but plays essential role in guaranteeing non-trivial dynamics at quantum mechanical level in the required limit. This "spectator" mechanism is significant in investigating the B-A effects and related topics in both aspects of theory and experiment.

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