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Generic Quantum Rate Equations and 1st Order coherent resonant tunneling through an interacting coupled-quantum-dot interferometer and current noise BING DONG, X.L. LEI, Shanghai Jiaotong University, China, NORMAN J.M. HORING, Stevens Institute of Technology, Hoboken, NJ, JAY D. MANCINI, Kingsborough Community College of CUNY — We analyze coherent resonant tunneling through an Aharonov-Bohm (AB) interferometer in the weak tunneling limit. The interferometer consists of two vertically coupled quantum dots (CQD) in a parallel arrangement. In this, we establish a set of quantum rate equations (QREs) in terms of the eigenstate-representation, which are valid for arbitrary bias-voltage, temperature and interdot hopping strength. Furthermore, we derive the current and frequency-independent shot noise formulae in terms of reduced density matrices. We find that the QREs involve some new coherence terms associated with effective dot-dot hopping due to tunneling to leads which appear in a finite bias-voltage regime even for a CQD in a series configuration, as well as in a parallel arrangement. These terms play a decisive role in determining asymmetric transport features of a series CQD. Moreover, the combined effects of the additional coherence terms and the interference terms between the two path branches give rise to interesting transport features for a parallel CQD: finite-bias-induced AB oscillations of current, and magnetic-flux-controllable negative differential conductance and a huge Fano factor.

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