Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Resonance modulations by tunable multi-level inter-dot coupling in a parallel quantum dot interferometer YONG JOE, CHUNGHEE ROH, ERIC HEDIN, Ball State University, ARKADY SATANIN, Russian Academy of Science — We investigate the characteristics of resonance through parallel-coupled double quantum dots in an Aharonov-Bohm interferometer. In this system, we calculate the quantum transmission for different combinations of two-level inter-dot coupling by employing an exactly solvable tight-binding formalism. First, for the case that only one level in each dot participates in transport, we present contour plots of the transmission as a function of the energy level in each dot for different strengths of inter-dot coupling and magnetic flux. As the inter-dot coupling increases, an anti-crossing of resonances for a fixed magnetic flux appears due to the coalescence of two dots into one. In addition, a doubling of the periodicity in the transmission and the swing of the Fano resonance are also observed to be modulated by the magnetic flux. Second, for the case that two-levels in each dot contribute to the transport, an extra Fano resonance in the transmission appears by tuning the inter-dot coupling between the even–odd parity states. On the other hand, the inter-dot coupling of the odd-odd parity states gives rise to a collapse of the Fano dip in the transmission resonance. Finally, we discuss the resonance effect on the interplay between the two-level inter-dot coupling and magnetic flux.

Yong Joe
Ball State University

Date submitted: 26 Nov 2007 Electronic form version 1.4