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Fano quadrupole in a nanoscale ring[1] ARKADY SATANIN, YONG JOE, Ball State University, Muncie, IN, GERHARD KLIMECK, Purdue University, West Lafayette, IN — In solid state systems such as Aharonov-Bohm (AB) rings, two-dimensional electronic waveguides, and barriers, interference of a localized wave with propagating states produces Fano resonances in the conductance. The scattering amplitude near a Fano zero-pole pair behaves like the amplitude of a dipole when the pole and the zero play the roles of a particle and an antiparticle, respectively [1]. This separate Fano-dipole has been already observed in the AB ring with an embedded quantum dot (QD) [2]. In the present work, we examine new effects on the collision of Fano dipoles and its manifestation in the transmission. The numerical results for a realistic AB ring with two embedded QD's will be presented. We show that the two Fano-dipoles form a new quasi-particle, which behaves as a coupled object – the Fano quadrupole. This property gives an additional possibility of manipulating transmission resonances (a collapse of particle and hole) in a nanoscale ring by changing the parameters of the system. We discuss an analogy of Fano collision in an AB ring and a $\Gamma - X$ barrier [3]. [1] Z. Shao *et al.*, PRB **49**, 7453 (1994). [2] K. Kobayashi, *et al.* PRL, **85**, 256806 (2002). [3] R. C. Bowen, *et al.* PRB **52**, 2754 (1995).

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