

Coherence and Correlation of Electrons in Quantum Hybrid Systems

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To control coherence and correlation of electrons has been one of the most exciting issues in solid state physics. We have addressed this issue by means of the Fano effect, which occurs through the interference between the discrete state and energy continuum [1]. We have realized a tunable Fano system in a quantum dot (QD) embedded in an Aharonov-Bohm ring [2], where, with the aid of the continuum, the localized state inside the QD forms a coherent state that is itinerant over the system even in the Coulomb blockade. We have revealed several new aspects of Fano physics, such as the complex Fano parameter, the behavior of the phase of electrons through a QD, and the Fano state in the dissipative regime. Fano effect was also realized in a single QD [3] and in a side-coupled QD [4] even in the presence of Kondo correlation [5]. The observed Fano effect enables us to investigate the phase of electrons through a QD [6].

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