Session 23bD

Tunable Fano System: a Quantum Dot Embedded in an Aharonov-Bohm Ring **23bD1**

Kensuke Kobayashi, Hisashi Aikawa, Shingo Katsumoto, Yasuhiro Iye

Institute for Solid State Physics, University of Tokyo, Japan

The Fano effect, which originates from an interference between a localized energy state and the continuum, represents one of the most fundamental aspects of quantum mechanics. We have realized a tunable Fano system in a quantum dot embedded in an Aharonov-Bohm interferometer, which gives the first convincing demonstration of this effect in mesoscopic systems. With the aid of the continuum the localized state inside the quantum dot acquires itinerancy over the system even in the Coulomb blockade. Through the control of the parameters, which is an advantage of the present system over many other physical systems where the Fano effect is observed, unique properties of this effect on the phase and coherence of electrons have been revealed.

Efficiency of Mesoscopic Detectors **23bD2**

Markus Buttiker

Dept. Phys. Theor., University of Geneva, 24 Quai Ansermet, 1211 Geneva, Switzerland

We consider a mesoscopic detector with a conductance that is sensitive to a nearby, capacitively coupled two-state system. The time for a reliable measurement, the dephasing time and efficiency of the detector are expressed in terms of physical parameters which characterize the transverse charge noise power of the Coulomb coupled conductors. These parameters[1] are determined by a elemenets of a capacitance matrix and off-diagonal elements of the Wigner-Smith matrix. As a particular example we discuss the distribution of the efficiency of an ensemble of open chaotic quantum dots.

[1]S. Pilgram and M. Buttiker, cond-mat/0203340

23bD3 Effect of spin-orbit interaction in InGaAs-based Aharonov-Bohm Ring Structure*

Junsaku Nitta[a], Takaaki Koga[a,b], Frank Meijer[a]

[a]NTT Basic Research Laboratories, NTT Corporation, Atsugi, Kanagawa, 243-0198, Japan
[b]Nanostructure and Material Property, PRESTO, Japan Science and Technology Corporation

It is pointed out that the effect of spin-orbit interaction is manifestation of the Aharonov-Casher effect in the same sense as the effect of weak magnetic fields is the manifestation of the Aharonov-Bohm (AB) effect. Gate controlled AB experiments are performed in the presence of the spin-orbit interaction. To eliminate sample-specific features, we have focused on the ensemble averaged h/2e oscillations. The phase of magnetoresistance at B= 0 was fixed, and showed minima in the whole gate voltage range. This can be explained in terms of weak anti-localization. However, small oscillatory behavior as a function of the gate voltage was observed. The possible explanation is due to the spin interference affected by the spin-orbit interaction.
*This work was supported by the NEDO International Joint Research Grant Program.

23bD4 Spin precession observation in quantum corrections to resistance of $\mathbf{Si_{0.7}Ge_{0.3}}$/ $\mathbf{Si_{0.2}Ge_{0.8}}$ heterostructure with 2D gas

A. Rozheshchenko[a], V. V. Andrievskii[a], O. A. Mironov[b], Yu. F. Komnik[a], T. E. Whall[b]

[a]Institute for Low Temperature Physics and Engineering, 61103 Kharkov, Ukraine
[b]Department of Physics, University of Warwick, Coventry CV4 7AL, United Kingdom

The two dimensional hole gas (2DHG) magnetoresistance of $Si_{0.7}Ge_{0.3}/Si_{0.2}Ge_{0.8}$ heterostructure in a wide range of temperatures T=0.335K-20K and transport currents I=100 nA - 50 mkA is measured. In the vicinity B = 0, the sharp and positive in sign feature on smooth negative magnetoresistance is observed at lowest temperatures. The amplitude of this feature quickly fades with temperature and transport current. For experimental data analysis the theory of weak localization for 2DHG is applied.
The values obtained τ_{so} and τ_{tr} are used for the first time to define zero magnetic field splitting in the hole energy spectrum for a $Si_{0.7}Ge_{0.3}/Si_{0.2}Ge_{0.8}$ heterostructure: Δ=1.65 meV.