About the paper «RESONANT KONDO TRANSPARENCY OF A BARRIER WITH QUASILOCAL IMPURITY STATES" (GLAZMAN L.L., RAIKH M.E., 1088)

Leonid Glazman. Yale University, USA

The paper [1] predicted a strong enhancement of the tunneling conductance by the presence in a tunnel barrier of localized states with energies below the Fermi level. The striking part of the prediction is that although a resonant state far below the Fermi level does not contribute to the conduction directly, it may facilitate formation of a collective resonance right at the Fermi level for electrons traversing the barrier. This resonance is at the heart of the Kondo effect. Its uncovered relation to the tunneling conductance paved the way for detailed experimental studies of the Kondo effect with the help of quantum dot devices.

The textbook manifestation of the Kondo effect was the rise of bulk resistivity upon lowering the temperature of a normal metal containing minute amounts of magnetic impurities [2]. This experimental observation was made as early as in 1930s and explained by Jun Kondo in 1960s. Kondo's theory treated electron scattering off magnetic impurities perturbatively and was sufficient for explaining virtually all the experiments with the bulk samples. At the same time, more sophisticated theories were predicting that at low enough electron energies the scattering must become extremely strong, reaching so-called unitary limit. There were no practical ways for the corresponding experimental studies. It was this JETP Lett. paper and the independent work [3] which pointed out the existence of the Kondo *transmission resonance* in the tunneling conductance.

A magnetic impurity in a tunnel barrier between two leads can be engineered by interrupting the barrier by a gate-controlled quantum dot. The number of electrons in the dot can be tuned to be odd by means of the gate voltage, thus creating an S=1/2 state. The first credible observations [4] of the Kondo-enhanced conductance through a quantum dot appeared about 10 years after the publication of the two mentioned theory papers. That have lead to an explosive growth of the field. It turned out that the Kondo effect in mesoscopic devices is a ubiquitous phenomenon rooted in the combination of electron levels degeneracy with interaction between confined electrons [5]. For example, Kondo effect may develop if one tunes two different orbital states to a resonance by means of Zeeman splitting [6]. In fact, since early 2000s the Kondo effect in quantum dots underwent a transition from being enigmatic to becoming so common that it is viewed sometimes as a nuisance. A point in case is the current search for the solid-state realizations of Majorana fermions: their manifestations in electron transport experiments can be confused with those of the Kondo effect [7].

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