SEMINARIUM Z MAGNETYZMU I NADPRZEWODNICTWA

Uprzejmie zawiadamiamy, że w **ŚRODĘ**

27 października 2010 r., o godz. 10:00

w sali 203 (bud. 1) odbędzie się seminarium, na którym

Dr Maciej Zgirski

Quantronics Group, CEA, Saclay, France

wygłosi referat na temat:

„*Josephson effect in superconducting weak links*”

Everybody knows famous Josephson formula $I = I_0 \sin(\Phi)$ for which its discoverer was awarded Nobel Prize in 1972. It states that supercurrent goes through tunnel junction in absence of any voltage. Tunnel junction is one of many possible weak links. But do you know that there is a framework able to treat on the same footing all the different coupling structures (tunnel junctions, proximity effect bridges, point contacts, graphene, carbon nanotubes)? Within this framework, the basic Josephson weak link is a single conduction channel of arbitrary transmission probability τ connecting two superconducting electrodes. For a channel shorter than the superconducting coherence length, the Josephson coupling between both sides is established by two *Andreev bound states*: ground and excited. Each such bound state can be thought as localized Cooper pair of phase and transmission dependent binding energy (smaller than BCS value) and capable of transporting supercurrent up to ~50nA. The simplest test-bed for testing new unified picture of weak links is atomic contact. I will show how to obtain atomic contacts of few conducting channels each with tunable transmission. Embedding the atomic contact in one loop together with a Josephson junction allows for phase–biasing of the atomic contact by means of external magnetic flux threading the loop. Such a device is a highly asymmetric SQUID exhibiting an interference pattern (= flux dependence of the critical current). The interference pattern is in fact the current-phase relation of atomic contact itself which can be directly compared with the mesoscopic theory of the Josephson effect. Finally I will talk about trials to observe *excited Andreev bound state* which should be there but whose existence has not been confirmed experimentally yet. The trials will lead us to the field of Cavity Quantum Electrodynamics (= two level system embedded in coplanar resonator).

Serdecznie zapraszamy

Roman Puźniak
Henryk Szymczak
Andrzej Wiśniewski