CFEL SCIENCE

Max Planck Research Department for

Structural Dynamics

SEMINAR

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Seminar Room 108, DESY Bldg. 49

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Kondo effect in the presence of a spin-polarized current

The Kondo effect occurs when a localized magnetic moment is screened by the spins of the host metal electrons. Below a typical temperature known as Kondo temperature, this many-body interaction results in the emergence of a resonance in the density of states located near the Fermi level. For more than a decade, such a resonance has been investigated by transport measurements in single Kondo impurities, consisting of magnetic atoms or artificial quantum dots (QD). Of particular interest for the emerging field of spintronics is the interaction of single Kondo impurities with ferromagnetic leads, where a splitting of the Kondo resonance is predicted. Several experimental and theoretical studies have been published on QDs, but are still lacking for single magnetic atoms. Here, we present the first low-temperature STM measurements showing a Kondo splitting of a single atom in the presence of a spin-polarized current. A cobalt atom on the Cu(100) surface presents a Kondo resonance, which we are able to split by approaching a magnetic tip covered by copper. The original aspect of this study is to use copper as a spacer between the magnetic tip and the Co atom to minimize the magnetic direct couplings. With the additional support of equation of motion (EOM) calculations, we show that the splitting is produced mainly by the spinpolarized current flowing across the junction. We also evidence that the Kondo splitting is weakened when a direct ferromagnetic coupling is present. This study demonstrates the impact of magnetic interactions and of the spin-polarized current in the Kondo effect.

UHH

Host: Sebastian Loth, MPSD-DNES, CFEL