The angulon quasiparticle: from molecules in superfluids to ultrafast magnetism

Recently we have predicted a new quasiparticle - the angulon - which is formed when a quantum impurity (such as an electron, atom, or molecule) exchanges its orbital angular momentum with a many-particle environment (such as lattice phonons or a Fermi sea) [1,2].

Soon thereafter we obtained a strong evidence that angulons do exist, and are formed in experiments on molecules trapped inside superfluid helium nanodroplets [3]. The angulon theory thereby provided a simple explanation for experimental data accumulated during last two decades. Moreover, casting the many-particle problem in terms of angulons amounts to a drastic simplification and allows to tackle previously intractable problems related to quantum dynamics [4].

In this presentation we will introduce the angulon concept and discuss novel physical phenomena [1,5] arising from the angular momentum exchange in quantum many-particle systems. We will describe the applications of angulons to modern experiments on quantum impurities and on non-equilibrium magnetism.

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