CEA - Saclay 91191 Gif-sur-yvette Cedex

Service de Physique de l'Etat Condensé

SÉMINAIRE

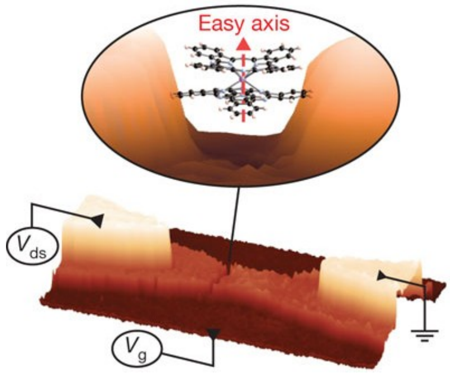
Mercredi 19 Février 2014 à 11h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

Read-out and coherent manipulation of a single nuclear spin

Stefan Thiele

Institut Néel, Grenoble



Three-dimensional extrapolation of a scanning-electron-microscope image showing the most favourable structure of the single-molecule-based transistor. A schematic zoom into the nano gap shows the molecular structure of the TbPc2 SMM and its easy axis. The charge state of the ligand read-out dot can be controlled by the gate voltage, Vg, and the voltage difference between the electrodes is controlled through the drain-source voltage, Vds

The realization of a functional quantum computer is one of the most ambitious technologically goals of today's scientists. Its basic building block is composed of a two-level quantum system, namely a quantum bit (or qubit). Among the other existing concepts, spin based devices are very attractive since they benefit from the steady progress in nanofabrication and allow for the electrical read-out of the qubit state.
In this context, we investigated a single nuclear-spin qubit embedded in a molecular spin-transistor. The device allowed for an electrical, non-destructive read-out of the nuclear spin state. Exploiting this property we were able to measure the real-time quantum trajectory of an isolated nuclear spin qubit. Furthermore, using a novel technique, we demonstrated the coherent manipulation of a nuclear spin by means of external electric fields. By performing first quantum operations we could measure the dephasing time of the single-nuclear spin and thus extended the potential of molecular spintronics beyond classical device applications.

A coffee break will be served at 11h00. The seminar will be given in English.