

CEA - Saclay 91191 Gif-sur-yvette Cedex  
Service de Physique de l'Etat Condensé  
SÉMINAIRE

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Mercredi 08/04/2015, 11h15-12h00

Orme des Merisiers SPEC Salle Itzykson, Bât.774

**Dynamical nuclear polarization in the strongly correlated regime: the paradox of Quantum Thermalization**

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Dynamic Nuclear Polarisation (DNP) is to date the most effective technique to increase the nuclear polarization up to a factor 100 000 opening disruptive perspectives for medical applications. In DNP, the nuclear spins are driven to an - out of equilibrium - hyperpolarized state by microwave saturation of the electron spins in interaction with them. Here we show that the electron dipolar interactions compete with the local magnetic fields resulting in two distinct dynamical phases: for strong interactions the electron spins equilibrate to an extremely low effective temperature that boosts DNP efficiency. For weak interaction this spin temperature is not defined and the polarisation profile has an "hole burning" shape characteristic of the non interacting case. The study of the many-body eigenstates reveals that these two phases are intimately related to the problem of thermalization in closed quantum systems where breaking of ergodicity is expected varying the strength of the interactions.

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