

SEMPARIS – Séminaires en région parisienne

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Séminaire du Laboratoire de Physique Théorique et Modèles Statistiques (Orsay)

Judi 12 Septembre 2019, 11 :00

LPTMS, Salle de seminaire

Domaines : cond-mat

Titre : *Multiferroics : magneto-electric coupling through phonons*

Orateur : **Daniel Cabra (University La Plata)**

Résumé : *We propose a microscopic magneto-electric model in which the coupling between spins and electric dipoles is mediated by lattice distortions. The magnetic sector is described by a spin $S=1/2$ Heisenberg model coupled directly to the lattice via a standard spin-Peierls term and indirectly to the electric dipole variables via the distortion of the surrounding electronic clouds. Electric dipoles are described by Ising variables for simplicity. We show that the effective magneto-electric coupling which arises due to the interconnecting lattice deformations is quite efficient in one-dimensional arrays. More precisely, we show using bosonization and extensive DMRG numerical simulations that increasing the magnetic field above the spin Peierls gap, a massive polarization switch-off occurs due to the proliferation of soliton pairs. We also analyze the effect of an external electric field E when the magnetic system is in a gapped (plateau) phase and show that the magnetization can be electrically switched between clearly distinct values. More general quasi-one-dimensional models and two-dimensional systems are also discussed.*
