


**Internship proposal 2009-2010**

<p><b>Laboratory : IJL (Nancy) and LLB (Saclay)</b></p> <p><b>Address :</b> <b>IJL : LPM/ Université Henri Poincaré- Nancy 1, BP 239 54506 Vandoeuvre</b> <b>LLB : CE-Saclay, 91191 Gif sur Yvette France</b></p> <p><b>Laboratory director :</b></p>	
<p><b>Internship supervisor : Sylvain Petit/Catherine Dufour</b></p> <p><b>Phone : 01 69 08 60 39 or 03 83 68 48 20</b></p> <p><b>e-mail: sylvain.petit@cea.fr / dufour@lpm.u-nancy.fr</b></p>	

*Magnetic excitations in Dy superlattices.*

<p><b>Scientific project:</b></p> <p>In magnetic films and superlattices, tailored structural properties can be obtained by Molecular Beam Epitaxy (interfaces, superperiodicity, strains..). These new structural characteristics have been shown to deeply modify the ground states, leading to new magnetic effects as well as new magnetic properties. To get more insight into this problem, our group has undertaken the first detailed study of the excited states. This calls for measurements of the spin dynamic carried out by inelastic neutron scattering. Rare-earth based artificial magnetic structures are of great interest both from a fundamental and a practical point of view. Indeed, rare-earth intermetallics are promising materials to be integrated in nanoscale devices, given their properties as permanent magnets, magnetostrictive sensors, perpendicular magnetic recording media.</p> <p>In this project, we will concentrate on spin dynamics properties of Dy based superlattices. Bulk Dy undergoes successively a paramagnetic-helicoïdal and a helicoïdal-ferromagnetic transition, when decreasing temperature. In nanoscale Dy/Y superlattices, the helical state is stabilized down to low temperature because of strain effect and the magnetic helix propagates coherently through a few nanometers thick non-magnetic Y layers. Both these effects are expected to modify the dispersions curves obtained from inelastic neutron scattering experiments.</p> <p>The aim of the project is to prepare two Dy/Y superlattices with different individual layers (this parameter modifies the magnetic coupling) by Molecular Beam Epitaxy, to characterize their magnetic phase diagram using SQUID magnetometry and elastic neutron scattering, and finally to measure the dispersion curves as a function of temperature and magnetic field using inelastic neutron scattering. Anisotropy parameters, magnetic coupling strength will be deduced from these measurements.</p>
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<p><b>Techniques in use :</b> Molecular Beam Epitaxy, SQUID magnetometry, elastic and inelastic neutron scattering.</p>
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<p><b>Applicant skills :</b> knowledge in magnetism, basic knowledge in crystallography.</p>
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<p><b>Granted internship :</b> yes ( 400-800 euros/month)</p> <p><b>C'nano IdF laboratory (France only) :</b> yes</p> <p><b>Possibility for a thesis :</b> yes</p>
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