



Institut de Minéralogie et de Physique des Milieux Condensés  
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# SÉMINAIRE

## Lundi 5 décembre, 10h30

Salle de Conférence, 4ème étage, Tour 22-23, Salle 1  
IMPMC, Université P. et M. Curie, 4, Place Jussieu, 75005 Paris

### Luigi PAOLASINI

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## X-RAYS ILLUMINATE THE MAGNETISM OF MULTIFERROICS

The study of the multiferroics materials is a subject of great expansion today thanks to the discovery of a strong coupling between the spontaneous long-range magnetic order and the ferroelectric order. The grand challenge is to find multifunctional materials where many physical properties like magnetism, ferroelectricity and ferroelasticity, could be simultaneously be exploited in electronic devices. This work shows how the magnetic elastic diffraction by circular polarized X-rays could be a used to investigate the spin-lattice coupling in a new class of multiferroics materials, where the development of an incommensurate magnetic cycloid modulation is responsible for the macroscopic ferroelectric polarization. We used an electric field to image the evolution of the magnetic domains and to determine with great accuracy the magnetic structure, by encoding the amplitude and the phase of the ordered magnetic moments. The application of a magnetic field in the ferroelectric phase allow us to study the oriented displacements of atomic sites at the femtoscale, by exploiting the magnetostriction mechanism. A theoretical analysis of the observed displacements shed light on the basic mechanism responsible for the magneto-electric coupling in these compounds.

1 - F. Fabrizi *et al.* *Phys. Rev. Lett.* **102** (2009) 237205.

2 - H.C. Walker *et al.* *Science* **333** (2011) 1273-1276.

3 - F. Fabrizi *et al.* *Phys. Rev. B* **82** (2010) 024434.