Internship offered in M2 2018-2019

**Responsible for internship**

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<thead>
<tr>
<th>Name</th>
<th>Location</th>
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<tr>
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**Group:** PMTeQ

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**Group website:** [http://www.insp.jussieu.fr/Phonons-and-magnons.html](http://www.insp.jussieu.fr/Phonons-and-magnons.html)

**Internship topic:** Control of magnetism by strain waves

This project aims to study the coupling of strain and magnetization in magnetostrictive materials with the long-term prospect of switching magnetic data bits in memory or logic devices with other means than a magnetic field or a current.

In ferromagnetic materials strain waves, also called coherent phonons or acoustic waves, can couple very efficiently to the magnetic excitations (magnons), provided their frequency is close to the magnon frequency, typically in the GHz range. This coupling can be so efficient that it can fully reverse the magnetization, when exploiting non-linear magnetization dynamics effects.

We have recently developed a technique to excite and probe the coupled dynamics of coherent surface phonons and excited magnons with laser pulses with space (µm) and time (ps) resolution, allowing to image the travelling waves.

The internship will focus on the study of the onset of the non-linear regime in a well-mastered ferromagnetic semiconductor layer where the linear regime is already well understood. We expect to detect the appearance of additional harmonics in the magnon frequency spectrum and a deformation of the wave front. The data will be compared to what is expected from the theory of a coupled magnon-phonon system. Further developments to an antiferromagnetic system will also be considered.

**Techniques involved:** ultra-fast lasers and cryogenics, magneto-optics, radio-frequency devices, basic numerical simulation tools

**Type of internship:** theoretical, experimental, mixed

**Paid internship:** Yes

**Can this internship be continued for a PhD?** Yes

**If yes, type of PhD funding envisaged is:** Doctoral School