Magnetization dynamics in nanostructures

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Magnetism Group

6 permanent members

- Ferromagnetism
  - Ferromagnetic Resonance
  - SQUID Magnetometry
  - Micromagnetism

- Quantum Magnetism
  - Electron Spin Resonance
  - Magnetic semiconductors
  - Spin Quantum Bit
**Ferromagnetic Resonance**

Resonant cavity-based approach (fixed frequency: X-band 9GHz)

Electrical approach (Broadband FMR: coplanar waveguide + VNA)

Technique of choice to determine magnetic properties like magnetic anisotropy, magnetic relaxation mechanisms (magnetic damping), orbital moment or spin-orbit torques
Magnetic thin films are extensively studied for interesting applications in magnetic recording or as magnetic electrodes in spintronics: $\text{Mn}_5\text{Ge}_3$ single crystals, soft ferromagnet MnCoGe, semi-metal Heusler compound MnCo$_2$Ge.

From FMR spectra the magneto-crystalline anisotropy can be determined, which reflects the symmetry of the crystalline lattice, and has its roots in the spin-orbit coupling and anisotropy of the crystal field.

From the study of the FMR linewidth, the magnetic relaxation processes are investigated and the magnetic relaxation parameters are determined.
**High frequency dynamics of magnetic walls in nanowires**

- Systematic displacement of magnetic domain walls trapped at artificial constrictions in a ferromagnetic nanowire - at the foundation of emergent and promising technologies for high-density data storage and magnetic logic devices

- Complex non-linear domain wall dynamics under harmonic excitation: magnetic Duffing oscillator → neuromorphic computing