



**UNIMORE**  
UNIVERSITÀ DEGLI STUDI DI  
MODENA E REGGIO EMILIA

Dipartimento di Scienze Fisiche,  
Informatiche e Matematiche



## FIM-S3 SEMINAR

# Time resolved pump/probe photoelectron spectroscopy of magnetic materials: femtomagnetism seen from the electronic structure point of view

**Tuesday November 5<sup>th</sup>, 2024 – 16.00 (sharp)**

S3 Seminar Room, 3<sup>rd</sup> Floor, Physics building

Remote link: [Teams](#)

## Speaker

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## Abstract

Femtomagnetism describe the dynamics in magnetic properties induced by femtosecond laser pulses. I will present time resolved pump/probe photoelectron spectroscopy experiments on magnetic systems performed in collaboration with several groups using synchrotron radiation, HHG sources and free electron lasers. Usually, the ferromagnetic order is destroyed and the system becomes paramagnetic. Time scale of the process is strongly related to sample electronic structure [1] and laser fluence. [2] In few cases, a temperature increase can promote the formation of magnetic order. It is the case of FeRh, a metallic material that undergoes a metamagnetic first-order phase transition from antiferromagnetic (AFM) to ferromagnetic (FM) order at 360 K, with coupled structural, magnetic, and electronic order parameters. [3] In this last case, theoretical calculations demonstrate how the microscopic manifestation of the magnetic phase transitions resides in particular features of the electronic structure. [4]

[1] M. Pacé et al, Laser induced ultrafast Gd 4f spin dynamics at the surface of amorphous CoxGd100-x ferrimagnetic alloys, JESRP 275, 147461 (2024)

[2] G.M.Pierantozzi et al. Relevance of thermal disorder in the electronic and spin ultrafast dynamics of iron in the low-perturbation regime, Phys. Rev. B 109, 064411 (2024)

[3] Pressacco, F. et al. Laser induced phase transition in epitaxial FeRh layers studied by pump-probe valence band photoemission. Struct. Dyn. 5, 034501 (2018)

[4] Pressacco F. et al., 'Subpicosecond metamagnetic phase transition in FeRh driven by non-equilibrium electron dynamics', Nature Communications 12, 5088 (2021).

**Host:** Elisa Molinari

In collaboration with

