Advanced materials research with ultrafast and coherent x-rays at the FERMI free-electron laser

Giovanni De Ninno, on behalf of the FERMI collaboration
Elettra Sincrotrone Trieste, Trieste, Italy
University of Nova Gorica, Nova Gorica, Slovenia

FERMI, the free-electron laser facility located at Elettra Sincrotrone Trieste (Italy), provides fully coherent and wavelength-tunable extreme ultraviolet (XUV) and soft X-ray pulses for cutting-edge investigations of matter on ultrafast timescales.

The unique characteristics of FERMI, including high temporal coherence, flexible polarization control, narrow bandwidth, and advanced pump–probe capabilities, enable a broad range of experiments in materials science, condensed matter physics, chemistry, and nanoscience. Current research activities include investigations of ultrafast magnetization dynamics, photoinduced phase transitions, coherent phonon and acoustic excitations, nonlinear light–matter interactions in the XUV regime, and element-selective dynamics in complex materials.

In this contribution, we present the main experimental opportunities available at FERMI, with particular emphasis on applications relevant to the materials science community. Examples of recent experiments demonstrate how coherent XUV and soft X-ray techniques can provide unique insight into electronic, magnetic, and structural dynamics on femtosecond timescales.

The presentation also introduces the user access program at FERMI and discuss opportunities for new international collaborations with the Serbian materials science community.