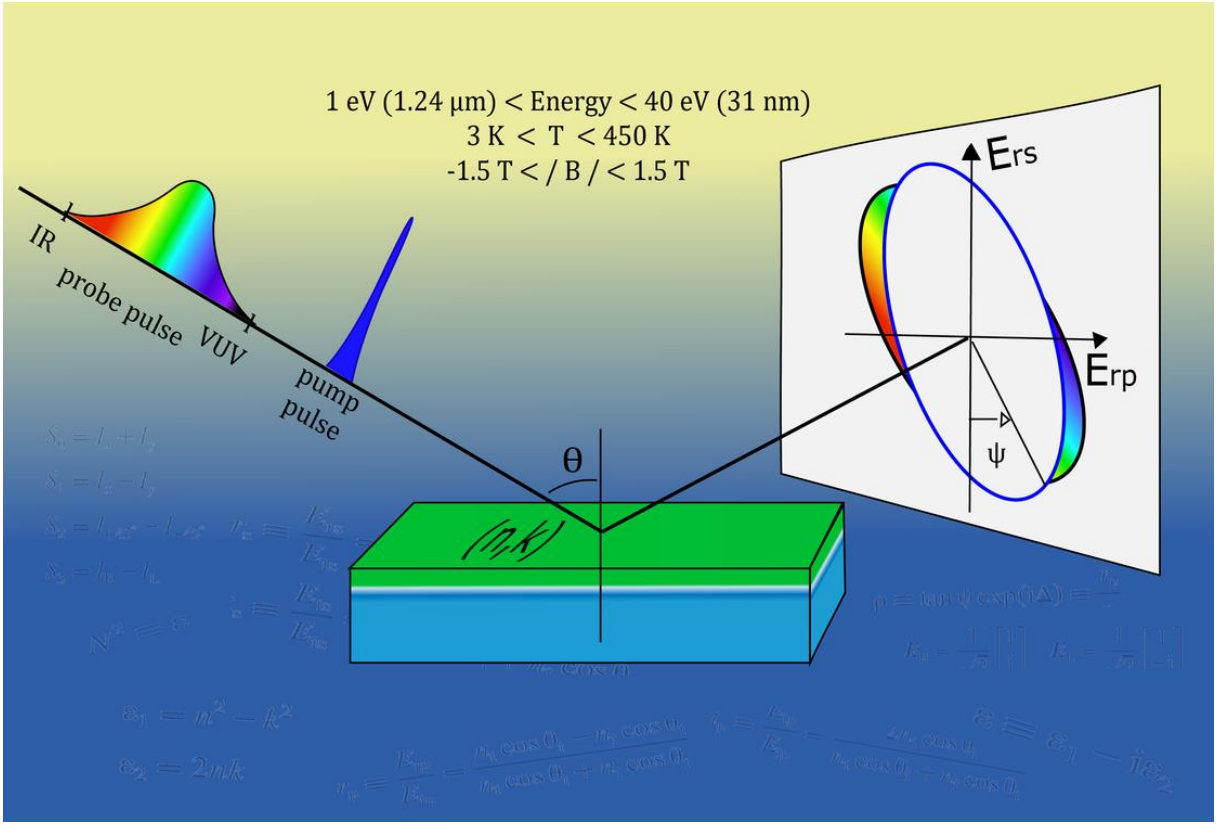
VUV and Soft X-ray Materials Science



At ELI-Beamlines we will push the boundaries in the research of complex materials and condensed matter systems by developing an innovative magneto-optical ellipsometry system that works up to energies of 40 eV. The system will be composed of an ellipsometry setup optimized for VUV operation as well as a fast-switching magnetic field that can be switched with the speed of the high harmonic generation (HHG)-source (kHz). Such a system has been successfully employed at visible-to-ultraviolet wavelengths [Rauer, 2005], and the extension that is made possible by the ELI HHG source will allow for the first time-resolved studies of the charge dynamics and spin-polarization in the VUV. Additionaly, the ellipsometer will offer the posibility of obtaining transient spectra thanks to its two colour pump-probe setup.

Layered materials can display absolutely fascinating properties at the interfaces. One example is the development of a two-dimensional electron gas at the interface between SrTiO3 and LaAlO3 [Asmara, 2014]. Such striking properties are related to the way that transition metals are controlled by their d-shell. Understanding the complex phase diagrams of transition-metal oxides requires a detailed understanding of the competing degrees of freedom in these materials upon charge and spin transfer. This type of dynamics is not only related to novel surface and interface phenomena but also to important phenomena in the bulk, such as colossal magneto resistance and

high-temperature superconductivity [Rusydi, 2008, Rauer, 2005, Neuber, 2003], which in spite of three decades of intense research is still poorly understood.

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