THz Kerr spectroscopy of chiral superconductors

Summary

Unconventional superconductivity is an active field of condensed matter research, where the theoretical models can be experimentally differentiated by the predictions they make for the symmetries of the superconducting order parameter. Interesting to us chiral superconductors possess non-trivial topological properties resulting in superconducting order parameters that may break time-reversal symmetry, and that we will experimentally detect by measuring the polar Kerr angle.

Research field:	Applied physics and mathematics
Supervisors:	Urmas Nagel Girsh Blumberg
Availability:	This position is available.
Offered by:	School of Science National Institute Of Chemical Physics And Biophysics
Application deadline:	Applications are accepted between June 01, 2024 00:00 and June 30, 2024 23:59 (Europe/Zurich)

Description

The essential properties of quantum materials (https://en.wikipedia.org/wiki/Quantum_materials) can only be described using quantum mechanical description of strong electronic correlations. These correlations can take the form of electronic orders (superconductors, magnetic systems) or be linked to other kinds of quantum effects.

The proposed PhD work will focus on studying chiral superconductors that possess non-trivial topological properties resulting in superconducting order parameters that may break time-reversal symmetry. We use THz spectroscopy as the main tool. We study fundamental physical properties of complex novel materials that may have high-tech applications. We collaborate with leading theoreticians and crystal growers in the field. The obtained information is useful to build theoretical models that describe microscopic mechanisms, needed to design new materials in the future.

The PhD candidate will participate in the development and use of a new generation of spectroscopic instrumentation in the sub-THz frequency range that is comparable to the gap magnitude of many unconventional superconductors. Unconventional superconductivity is an active field of condensed matter research, where the theoretical models can be experimentally differentiated by the predictions they make for the symmetries of the superconducting order parameter. The project is financed by a grant from the Estonian Research Council and an ERC Advanced grant.

Responsibilities:

The PhD candidate will work in laboratory, plan and perform the experiments, analyze results, and write papers.

The applicants should fulfill the following requirements:

The PhD candidate must have taken courses on quantum mechanics and solid-state physics at master's level.

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