THz spectroscopy of quantum materials

Summary

This PhD project in experimental physics is focused on studying fundamental physical properties of complex novel materials that may have high-tech applications. We use THz spectroscopy as the main tool as it probes low energy excitations what are characteristic to quantum systems. Specifically, we are studying novel superconductors.

Research field:	Earth sciences
Supervisors:	Urmas Nagel Toomas Rõõm
Availability:	This position is available.
Offered by:	National Institute Of Chemical Physics And Biophysics
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

Description

The essential properties of quantum materials can only be described using a quantum mechanical description of strong electronic correlations. These correlations can create electronic and magnetic orders (superconductivity, magnetism) or be linked to other kinds of quantum effects.

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

The PhD student 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 energy gap 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 PhD student will work in a laboratory, plan and perform experiments, analyze results, and write papers.

Applicants must have taken courses on quantum mechanics and solid-state physics at Master's level.

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