量子物理学・ナノサイエンス第 440 回セミナー

Terahertz-driven phonon angular momentum in perovskites

講師　：　Professor Martina Basini

Department of Physics, ETH Zurich, Switzerland

日程　：　5 月 22 日（金）16:30－

場所　：　本館 2 階 290 物理学系輪講室

概　要

In the solid state, processes involving angular momentum and its transfer have underpinned numerous foundational phenomena in physics, including magnetism, the conventional and anomalous quantum Hall effects, and orbital magnetism. The advent of laser sources in the terahertz frequency range has opened new avenues for the coherent excitation of phonons that carry angular momentum and enable the exploration of angular momentum transfer among different subsystems. This emerging field has revealed a range of novel phenomena-such as the phonon Hall effect, ultrafast Einstein-de Haas effect, phonon Faraday effect, and phonon Zeeman effect [1, 2], highlighting the role of phonons in angular momentum dynamics.

In this seminar, I will present different methods for preparing an orbital angular momentum state for both IR-active and Raman-active phonons in centrosymmetric perovskites and discuss its coupling to macroscopic properties. Particularly, I will focus on (i) a phonon-associated, magnetic-like contribution generated in $SrTiO_3$ and $KTaO_3$ by a strong circularly polarised terahertz field, resonant to its soft phonon [3] and, on (ii) evidence of terahertz-driven strain in $LaAlO_3$, revealed by an unconventional decay in the angular momentum dynamics [4].

References

[1] M. Basini *et al.* Nature **628**, 534 (2024).
[2] C. S. Davies *et al.* Nature **628**, 540 (2024).
[3] In preparation, THz field-induced magnetic-like response in the quantum paraelectric diamagnet $KTaO_3$.
[4] M. Basini *et al.* Phys. Rev. Lett. **136**, 156902 (2026).

連絡教員　　佐藤　琢哉（内線 2716）