

2023 IBS-CALDES Seminar

- ✓ **Date & Time:** 4:00PM ~ 5:00PM, December 05 (Tue), 2023
- ✓ **Venue:** IBS POSTECH Campus Bldg. 104 (Auditorium)
- ✓ **Speaker:** Prof. Jeongwoo KIM (Incheon National University)
- ✓ **Title:** “Optoelectronic manifestation of orbital angular momentum driven by chiral hopping in trigonal Se chains”

Organized by Prof. Han Woong YEOM (yeom@postech.ac.kr, 054-260-9000)
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Optoelectronic manifestation of orbital angular momentum driven by chiral hopping in trigonal Se chains

Jeongwoo Kim

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Chiral materials have garnered significant attention in the field of condensed matter physics. Nevertheless, the magnetic moment induced by the chiral spatial motion of electrons in helical materials, such as elemental Te and Se, remains inadequately understood. In this talk, I present the development of quantum angular momentum enforced by chirality using static and time-dependent density functional theory calculations for an elemental Se chain. Our findings reveal the emergence of an unconventional orbital texture driven by the chiral geometry, giving rise to a non-vanishing current-induced orbital moment. By incorporating spin-orbit coupling, we demonstrate that a current-induced spin accumulation arises in the chiral chain, which fundamentally differs from the conventional Edelstein effect. Furthermore, we demonstrate the optoelectronic detection of the orbital angular momentum in the chiral Se chain using the generation of photocurrent under circularly polarized light. Our results provide a fundamental understanding of the interplay between spin and orbital degrees of freedom in chiral geometries, which paves the way for design of novel orbitronic/spintronic devices utilizing chiral materials.