

Frontiers of Orbital Physics: Statics, Dynamics, and Transport of Orbital Angular Momentum (SYOP)

jointly organised by
 the Magnetism Division (MA),
 the Surface Science Division (O),
 the Crystalline Solids and their Microstructure Division (KFM),
 the Thin Films Division (DS),
 the Semiconductor Physics Division (HL) and
 the Low Temperature Physics Division (TT)

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The interplay of orbital, spin, and lattice leads to not only exotic phases of matter such as orbital ordering in multiferroic materials and orbital Chern insulator states in twisted bilayer graphene but also dynamic phenomena including orbital Hall effect, orbital torque, and topological orbital magnetoelectric response. While so far the focus has been on spin currents, orbital currents, the flow of the electrons with finite orbital angular momentum, is found to be extremely efficient in many materials and can outperform conventional spin current effects. As recently demonstrated, orbital currents can additionally play a pivotal role in generating spin currents thus leading to torques with unprecedented amplitude to manipulate magnetization. On the other hand, optical means including vortex beams provide a potentially outstanding means of generating and manipulating orbital order and orbital transport. So far these effects have been observed in metallic heterostructures where light metals and their oxides generate strong orbital currents as well as oxidic 2DEG heterostructures that show efficient orbital to charge conversion thus showing that orbital currents can play a role in many systems. Developing methods and materials for harnessing orbital currents can thus potentially have significant impact and open a new direction in spintronics research. This session brings experts on the orbital physics from different areas of condensed matter physics in one place to promote collaborations beyond the boundaries of each community, share knowledge on cutting edge theoretical and experimental methods, and discuss challenges and future directions of the orbital physics. The invited speakers include not only experts on oxide multiferroic materials and spintronic devices but also on new experimental techniques that can unambiguously detect the orbital ordering and dynamics in solids and optical methods.

Overview of Invited Talks and Sessions

(Lecture hall H1)

Invited Talks

SYOP 1.1	Mon	9:30–10:00	H1	Orbital degeneracy in transition metal compounds: Jahn-Teller effect, spin-orbit coupling and quantum effects — ●DANIEL KHOMSKII
SYOP 1.2	Mon	10:00–10:30	H1	Orbital magnetism out of equilibrium: driving orbital motion with fluctuations, fields and currents — ●YURIY MOKROUSOV
SYOP 1.3	Mon	10:30–11:00	H1	Orbitronics: new torques and magnetoresistance effects — ●MATHIAS KLÄUI
SYOP 1.4	Mon	11:15–11:45	H1	Orbital and total angular momenta dichroism of the THz vortex beams at the antiferromagnetic resonances — ●ANDREI SIRENKO
SYOP 1.5	Mon	11:45–12:15	H1	Observation of the orbital Hall effect in a light metal Ti — ●GYUNG-MIN CHOI

Sessions

SYOP 1.1–1.5	Mon	9:30–12:15	H1	Frontiers of Orbital Physics: Statics, Dynamics, and Transport of Orbital Angular Momentum
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