

# NTML(BRL)-APCTP SEMINAR SERIES

## Topological Matter Out of Equilibrium

**Period** September 10 (Fri.), 2021 ~ January 28 (Fri.), 2022

**Venue** Online (ZOOM)

**Overview** Recently, a small but ambitious research group, funded by National Research Foundation (NRF) for three years, Nonlinear Topological Matter Laboratory (NTML) has been launched to investigate dynamical phase transitions in topological matter driven by electromagnetic fields including light. Our research group consists of three experimentalists (Prof. Heon-Jung Kim, Prof. Jong-Soo Rhyee, and Prof. Jungkil Kim) and one theorist (Prof. Ki-Seok Kim), which cover material preparation, electrical and thermal transport, light-matter interaction, device, and anomaly and transport theory. Additionally, the Junior Research Group “Non-equilibrium many-body physics” (led by a theorist Prof. Ryo Hanai) started in April 2021 with a broad interest in collective phenomena out of equilibrium. To promote this research direction in Korean Physical Society, we open NTML-APCTP seminar series on topological matter out of equilibrium, inviting several well-known experts in this direction mentioned above.

**Invited Speakers (Tentative)**

- Inti Sodemann (Max Planck Institute for the Physics of Complex System)  
[sodemann@pks.mpg.de](mailto:sodemann@pks.mpg.de)
- Ritesh Agarwal (Univ. of Pennsylvania)  
[riteshag@seas.upenn.edu](mailto:riteshag@seas.upenn.edu)
- Kornelius Nielsch (IFW-Dresden)  
[k.nielsch@ifw-dresden.de](mailto:k.nielsch@ifw-dresden.de)
- S. Nakatsuji (Univ. of Tokyo)  
[satoru@phys.s.u-tokyo.ac.jp](mailto:satoru@phys.s.u-tokyo.ac.jp)
- N. Nagaosa (Univ. of Tokyo)  
[nagaosa@riken.jp](mailto:nagaosa@riken.jp)

**Organizers**

Heonjung Kim (Daegu Univ.), Jongsoo Rhyee (Kyung Hee Univ.), Jungkil Kim (Jeju Nat. Univ.), Kiseok Kim (POSTECH), Ryo Hanai (APCTP)

# NTML(BRL)-APCTP SEMINAR SERIES

## Berry Phases and Non-linear Optoelectronic Phenomena

**Dr. Inti Sodemann**

*Max Planck Institute for the Physics of Complex Systems*

**September 10th (Fri.) 16:00 (KST)**

**ZOOM Webinar**

I will review a series of novel non-linear transport and optical phenomena that arise from the interplay of the electronic Berry phases in Bloch bands. I will begin by describing the non-linear Hall effect and the notion of the Berry curvature dipole emphasizing its interpretation as a non-linear counterpart to the Drude weight. I will highlight some of the most spectacular manifestations of these phenomena that have not been experimentally observed yet. This will lead us to discuss the quantum rectification sum rule: a new sum rule for the rectification conductivity of time reversal invariant materials that includes low frequency intra-band contributions and also inter-band optical contributions from shift currents. Finally, I will describe a new non-perturbative regime of optically driven current rectification, known as the Rabi regime. The photocurrent current in this Rabi regime becomes independent of the relaxation rate of photo-carriers and is determined only by the ideal band structure. I will present estimates to propose that this regime is within experimental reach in nodal Weyl semimetals.

### ■ ZOOM Webinar

- 1) Please register through this ZOOM link  
[https://us06web.zoom.us/meeting/register/tZUpc-iopzwsEtwq9WHzRrp-Ki\\_iTM6v0Qzo](https://us06web.zoom.us/meeting/register/tZUpc-iopzwsEtwq9WHzRrp-Ki_iTM6v0Qzo)
- 2) Join the webinar with a link generated after the registration
- 3) Please rename your profile - E.g. **Full name (affiliation)**

### ■ Contact information

- 1) Host: Ryo Hanai ([ryo.hanai@apctp.org](mailto:ryo.hanai@apctp.org))
- 2) Office: Research Support Team ([ra@apctp.org](mailto:ra@apctp.org))