

2021 Spring Seminar with **CALDES, IBS & SRC, POSTECH**

✓ **Date&Time:** April 30 (Fri), 3:00PM~

✓ **Venue:** Online (Zoom)

✓ **Speaker & Title**

1) 3:00PM~ Prof. Se Kwon Kim (KAIST)

Unconventional Spin Transport in Quantum Materials

2) 4:10PM~ Prof. Sanghoon Kim (Univ. of Ulsan)

Emerging spin-related phenomena in various material systems

Organized by Prof. Jun Sung Kim (js.kim@postech.ac.kr, 054-279-2098)
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■ **3:00PM~**

Unconventional Spin Transport in Quantum Materials

Se Kwon Kim

Dept. of Physics, KAIST

Recent advancements in spintronic techniques originally developed for spin-based devices now enable us to study fundamental spin physics of various quantum materials with unprecedented spin-current control and measurement, opening a new area of theoretical and experimental investigation of quantum systems. In this talk, we will introduce this emerging research area of spin transport in quantum materials which is fueled by the global interest in quantum information science. As examples, we will discuss our discovery of magnonic topological insulators realized by 2D magnets [1-3], which shows how spintronic techniques can be used for probing elusive quantum materials, and our prediction of long-range spin transport mediated by a vortex liquid in superconductors [4], which shows that quantum materials can provide novel platforms for efficient spin-transport devices. We will conclude the talk by offering a future outlook on quantum spintronics.

[1] S. K. Kim, H. Ochoa, R. Zarzuela, and Y. Tserkovnyak, "Realization of the Haldane-Kane-Mele Model in a System of Localized Spins," Phys. Rev. Lett. 117, 227201 (2016)

[2] G. Go, S. K. Kim, and K.-J. Lee, "Topological Magnon-Phonon Hybrid Excitations in Two-Dimensional Ferromagnets with Tunable Chern Numbers," Phys. Rev. Lett. 123, 237207 (2019)

[3] S. Zhang, G. Go, K.-J. Lee, S. K. Kim, "SU(3) Topology of Magnon-Phonon Hybridization in 2D Antiferromagnets," Phys. Rev. Lett. 124, 147204 (2020)

[4] S. K. Kim, R. Myers, and Y. Tserkovnyak, "Nonlocal Spin Transport Mediated by a Vortex Liquid in Superconductors," Phys. Rev. Lett. 121, 187203 (2018)

■ **4:10PM~**

Emerging spin-related phenomena in various material systems

Sanghoon Kim

Dept. of Physics, Univ. of Ulsan

Heterostructures composed of ultra-thin layers of heavy metal (HM) and ferromagnet (FM) have shown newly emerging spin-orbit related phenomena, such as the Rashba effect, spin-orbit torque, and Dzyaloshinskii–Moriya interaction (DMI). All of those share common features that originated from two essential physical ingredients: structural inversion asymmetry (SIA) and spin-orbit coupling (SOC). They enable to control magnetization by electrical current and to create chiral spin textures such as magnetic skyrmions. In this presentation, I am going to present recent issues in the spin-orbitronics and related research results with various material systems.