Center for Memory and Recording Research
Electrical and Computer Engineering Department

CMRR UC San Diego Electrical and Computer Engineering JACOBS SCHOOL OF ENGINEERING

HOSTED BY ERIC FULLERTON

SEMINAR TALK BY

Dmitry Ovchinnikov

when:

MONDAY, SEPTEMBER 19, 2022

4:00 PM Lecture

where:

JKW AUDITORIUM

CMRR BUILDING

Van der Waals Topological Magnets and Circuits

The breaking of time-reversal symmetry in topological insulators leads to novel quantum states of matter. One prominent example at the two-dimensional limit is the Chern insulator, which hosts dissipationless chiral edge states at sample boundaries. These chiral edge modes are perfect one-dimensional conductors whose chirality is defined by the material magnetization and in which backscattering is topologically forbidden. Recently, van der Waals topological magnet MnBi2Te4 emerged as a new solid-state platform for studies of the interplay between magnetism and topology. In this talk, I will present an overview of our progress toward controlling topological phase transitions and chiral edge modes in MnBi2Te4. First, I will establish how topological properties are intimately intertwined with magnetic states. I will then demonstrate electrical control of the number of chiral edge states. Finally, I will show the discovery of chiral edge modes along crystalline steps between regions of different thicknesses and how these modes can be harnessed for the engineering of simple topological circuits.

Bio: Dmitry Ovchinnikov obtained his Ph.D. from the Institute of Electrical and Micro Engineering of École Polytechnique Fédérale de Lausanne (EPFL), Switzerland in 2017. During his Ph.D., he performed multimodal experiments on two-dimensional semiconductors and developed disorder modulation techniques for low-dimensional systems. His Ph.D. thesis was awarded the EPFL EDMI Ph.D. thesis distinction award and the Gilbert Hausmann Ph.D. thesis award. Dmitry is the recipient of an early postdoc Swiss National Science Foundation (SNSF) mobility fellowship to perform studies on nanoscale van der Waals magnetic devices, which he carried out at the University of Washington. Currently, Dmitry is starting his lab at the Physics Department of the University of Kansas. His ongoing efforts range from exploring the fundamental physics of topological magnets and controlling topological and magnetic states to engineering novel device & circuit architectures based on topologically non-trivial band structures.