

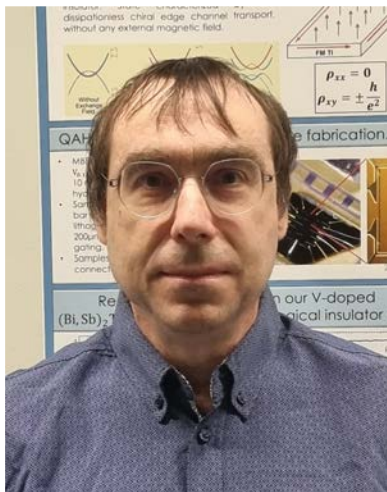
UCLA Department of Physics & Astronomy

COLLOQUIUM

Thursday, March 13th at 4 p.m.
1-434 PAB

Magnetic topological insulators: from fundamental physics to a quantum standard of resistance

Charles Gould
(University of Würzburg)



The quantum anomalous Hall effect (QAHE), first observed in Cr/V-doped $(\text{Bi,Sb})_2\text{Te}_3$, holds promise as a disruptive innovation in quantum metrology, for its potential to define a new generation of quantum standards of resistance. A goal of modern metrology is to combine the various standards into a combined “quantum electrical metrology toolbox”, that can perform quantum resistance, voltage and current metrology. Conventional quantum standards of resistance rely on the integer quantum Hall effect for their operation. The large external magnetic field they need makes a quantum standard of voltage (based on the AC Josephson effect) inoperable. The QAHE is the path to combining these standards.

To this aim, I will begin by reviewing the rich phenomenology we uncovered in our transport studies of these materials, including the transition of conventional electrodynamics to the axionic scaling regime as a function of samples thickness, as well as the observation of macroscopic quantum tunneling of the magnetization.

I will then turn towards applying the QAHE. Metrologically relevant precision of the quantization has already been demonstrated under challenging experimental conditions (extremely low temperature and low electrical current). Here, I will introduce a new sample geometry, a multi-terminal Corbino geometry, and show how its use can help push the window of operation towards higher temperature and current, and bring us closer to mainstream metrology application.

Host: Seth Putterman

Refreshments at 3:30 p.m. on the PAB Patio. Undergraduates Welcome!