December 6th, 2021 10:00 AM
QED & Materials seminar
Emil Bostroem

Title
"Optical generation and control of magnon currents and magnetic skyrmions"

Abstract
The demand for increased performance of technological devices via miniaturization comes at the cost of increased energy consumption. To meet this demand a new technological paradigm is necessary, where quantum mechanical phenomena in low-dimensional materials are exploited to reduce dissipation and enhance efficiency and memory capabilities. In particular, an attractive route to enter this paradigm is via magnetic excitations, where magnetic skyrmions and topological magnon edge currents hold great promise for realizing efficient memory and spintronics devices. Interfacing light and magnetic excitations in optomagnetic devices would further ensure processing frequencies comparable with electronic components.

In this talk I will present recent results on the optical generation and control of magnon currents in honeycomb antiferromagnets via the magnon photogalvanic effect. This effect can be understood as a consequence of angular momentum conservation on the three-fold rotation symmetric lattice, combined with an asymmetric magnon population created by the laser. I will also present results on the optical excitation of magnetic skyrmions in systems with itinerant electrons and localized magnetic moments. Here, the transient electronic currents induced by a laser give rise to an effective magnetic field that couples to the localized spins via spin-orbit and ultimately leading to skyrmion nucleation.

[1] E. Viñas Boström, T. Sadat Parvini, J. W. McIver, A. Rubio, S. Viola Kusminskiy, and M. A. Sentef, Phys. Rev. B 104, L100404 (2021)

[2] E. Viñas Boström, A. Rubio, and C. Verdozzi, arXiv:2010.16125