CMP Seminar
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Quantum friction effects in superfluids

Low-temperature ordered states of matter with spontaneously broken symmetry host collective excitations - Goldstone modes - that are coupled to the order parameter field. The collective excitations act on the order parameter as a thermal bath and give rise to its non-trivial dynamics that include effects like "quantum friction," a stochastic Langevin force and effective Brownian motion. In this talk, I will discuss new theoretical and experimental results and ideas on such quantum friction effects in superfluids and magnetic systems. In the first part of my talk, I will focus on quantum dynamics of topological textures, in particular solitons/domain walls, propagating in low-dimensional superfluids/magnets. An effective quasi-classical equations of motion will be derived. It will be shown that interestingly the familiar Ohmic friction is absent in the integrable setup, but the equations contain non-Markovian dissipative forces [1]. I will explain a way to restore and control the Ohmic friction force and related Brownian motion of topological textures, as was demonstrated in a recent experiment [2].

References:
[1] D. Efimkin, J. Hofmann, and V. Galitski, "Non-Markovian quantum friction of bright solitons in superfluids," *Phys. Rev. Lett.* **116**, 225301 (2016)
[2] L. Ayckock *et al*., "Brownian motion of solitons," *Proc. Nat. Acad. Sciences* **114**, 2503 (2017)

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4:10 p.m.
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Prof. Mohammad Maghrebi - Host