

Chez Pierre

Presents ...

Monday, September 14, 2026

12:00pm – 1:00pm

Duboc room - 4-331



Chez Pierre Seminar

Boris Spivak, University of Washington

“Properties of two-level systems in current-carrying superconductors”

We show that in disordered s-wave superconductors, at sufficiently low frequencies ω , the coupling of two-level systems (TLS) to external ac electric fields increases dramatically in the presence of a dc supercurrent. This giant enhancement manifests in all ac linear and nonlinear phenomena. It leads to a parametric enhancement of the real part of the ac conductivity and, consequently, of supercurrent fluctuations. If the distribution of TLS relaxation times is broad, the conductivity is inversely proportional to ω , and the spectrum of the equilibrium current fluctuations takes the form of $1/f$ noise.

In the presence of localized spins the enhancement of the electromagnetic field absorption exists even in the absence of supercurrent. We discuss a new mechanism of interaction between electromagnetic waves and the localized spins in disordered superconductors. A supercurrent induces randomly distributed spin polarization of the itinerant electrons, which couples to the impurity spins by exchange interaction. As a result, the low-frequency dissipative part of the conductivity saturates to a nonzero value.