Condensed Matter Physics Seminar Series

Quantum-to-classical crossover in the spin glass dynamics of cavity QED simulators

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By solving the quench dynamics of a frustrated many-body spin-boson problem, we investigate the role of spin size on the dynamical formation of spin glass order. In particular, we observe that quantum and classical spin glasses exhibit markedly different evolution. The former displays a quick relaxation of magnetization together with an exponential dependence of the spin glass order parameter on spin size, while the latter has long-lasting prethermal magnetization and a spin glass order parameter independent of spin size. The quantum-to-classical crossover is sharp and occurs for relatively small spins, highlighting the fragility of the quantum regime. Furthermore, we show that spin glass order is resonantly enhanced when the frequency of the bosonic mediators of the interactions approaches the value of the transverse field. Our predictions are relevant for all spin glass systems with SU(2) degrees of freedom away from equilibrium, and can be examined in recently developed multi-mode cavity QED experiments.

Jamir Marino was born and studied physics in Palermo, Sicily. After his PhD under the supervision of A. Silva at SISSA (Trieste), he started a postdoctoral position in the group of S. Diehl in 2014 (Innsbruck-Dresden). In Winter 2015 he became Alexander von Humboldt Fellow in Cologne, and in Summer 2017 he moved to the US working at JILA/CU Boulder in the groups of A. M. Rey and R. Nandkishore. In Spring 2018 he started a Marie Curie Global Fellowship at Harvard University, collaborating with the research team of E. Demler. Since October 2019 he is a Junior Professor at the University of Mainz leading the 'NEUQUAM' research group. Since Fall 2023 he is a Pauli Visitor at the ETH Zurich. In Spring 2022 he held a QuantEmX Senior Scientist position at UC Berkeley. He is also the SPICE scientific coordinator for non-equilibrium dynamics and an Henriette Herz Scout of the Humboldt Foundation.

Friday, November 8th at 4pm
4-330 PAB