Colloquium

Quantum Simulations with Atoms and Photons

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Host: Julian Leonard

Abstract:Cavity quantum electrodynamics (QED) is one of the most powerful framework to observe and leverage quantum phenomena. While it has been thoroughly studied for simple quantum systems such as two-level systems or harmonic oscillators, it has recently become available for complex, correlated quantum many-body systems. In the last years, we have developed systems combining cavity QED with cold Fermi gases. In such a system, virtual photon exchanges between atoms yield a long-range interaction leading to emergent phenomena. I will describe how it induces charge-density wave ordering, and the deep insights on this transition provided by real-time measurements and high spatial resolution. I will then discuss the interplay of pairing, Pauli blocking and light-matter interactions in this system, the status of our understanding and some open questions. Last, I will outline the perspective open for quantum simulations in this platform, both from the conceptual and technological point of view.

Tuesday, April 28, 2026 11:00am - 12:00pm
Office Building West/Ground Floor/Heinzel Seminar Room

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