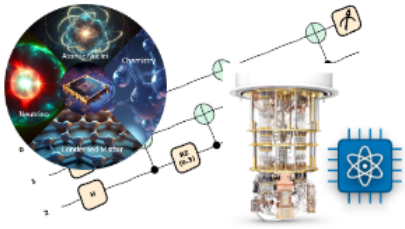

Contribution ID: **98** Type: **Contributed Talk (45min including questions)**

Hybrid algorithms for the simulation of fermionic systems on near-term quantum hardware.

Friday, November 21, 2025 9:00 AM (1 hour)

In this talk, I will explore the potential of hybrid quantum–classical algorithms for addressing fermionic problems in condensed matter physics and quantum chemistry on near-term quantum computers. For condensed matter applications, I will focus on the Quantum Selected Configuration Interaction (QSCI) method, in which a Hamiltonian is diagonalized in a basis of CI states obtained by sampling a quantum trial state. In particular, QSCI is employed as an impurity solver within the Ghost-Gutzwiller Ansatz (GGut) embedding framework to study the metal–insulator transition in the half-filled Anderson Impurity Model (AIM), as revealed by the density of states and computed using IQM's superconducting quantum hardware. For quantum chemistry, I will discuss the Quantum-Assisted Auxiliary-Field Quantum Monte Carlo (QC-AFQMC) method, which uses a quantum trial state to guide the classical QMC process. I will show how efficient compact trial states can be constructed within contextual subspaces and present algorithmic advances that reduce the classical scaling of QC-AFQMC by several orders of magnitude.

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