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Tensor Network methods for real-time dynamics of lattice gauge theories

Monday, 25 September 2023 12:00 (30 minutes)

Gauge theories are of paramount importance in our understanding of fundamental constituents of matter and their interactions, ranging from high-energy particle physics to low-temperature quantum many-body physics. However, the complete characterization of their phase diagrams and the full understanding of non-perturbative effects are still debated, especially at finite charge density, mostly due to the sign-problem affecting Monte Carlo numerical simulations. In recent years, a complementary numerical approach, Tensor Networks (TN) methods, in strict connection with emerging quantum technologies, have found increasing applications for studying Lattice Gauge Theories (LGTs). In this talk, I will present some recent results concerning the application of TN algorithms to the study of real-time dynamics of LGTs including dynamical matter. In particular, I will focus on the case of Quantum Electrodynamics, addressing intriguing phenomena such as string-breaking, dynamical confinement and scattering effects.

Main references:

- G. Magnifico, M. Dalmonte, P. Facchi, S. Pascazio, F. V. Pepe, E. Quantum 4, 281 (2020).
- M. Rigobello, S. Notarnicola, G. Magnifico, S. Montangero, Phys. Rev. D 104, 114501 (2021)

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