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Tensor-network algorithms for nonequilibrium dynamics

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Laser technology has made remarkable progress recently, opening new possibilities for nonequilibrium physics experiments. One of the exciting phenomena is quantum phase transitions induced by pulse irradiation, which lead to nonequilibrium metal-superconductor transitions. However, the theoretical analysis of these phenomena is challenging, as it requires computing the dynamic correlation function over two-time domains.
Exploiting the translational symmetry in infinite matrix-product-state representations, we present a novel simulation method based on the (infinite) time-evolved block decimation technique. We apply this technique to Mott insulators and simulate the time-dependent single-particle photoemission spectra, which can be measured by time- and angle-resolved photoemission spectroscopy experiments. We demonstrate that applying pump pulse irradiation to the Mott insulator in the simple Hubbard model triggers photoinduced insulator-to-metal transitions, associated with the formation of eta pairs.

References

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