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Spin-Boson Simulations with Trapped Ions (25+5)

Monday, January 13, 2025 4:30 PM (30 minutes)

Spin-boson models are common throughout physics. Trapper ion quantum computers are built off internal degrees of freedom in the ions (qubits) and external degrees of freedom (phonons). For quantum computation, the phonons are used as an information bus for generating entanglement between qubits, but are not used to store quantum information. We have recently used the spin and motional modes to perform quantum simulations of molecular dynamics of conical intersections [1] and vibrational energy transfer with structured baths [2]. After describing these results, we will explain how these methods can be applieed to the study of nuclear physics.

[1]J. Whitlow, Z. Jia, Y. Wang, C. Fang, J. Kim, and K.R. Brown, *Quantum simulation of conical intersections using trapped ions*, Nature Chemistry **15**, 1509 (2023)
[2] K. Sun, M. Kang, H. Nuomin, and G. Schwartz, D. N. Beratan, K. R. Brown, and J. Kim, *Quantum simulation of spin-boson models with structured bath*, arXiv:2405.14624

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