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Quantum computing with schematic nuclear models

A quantum simulation of the Agassi model from nuclear physics is proposed so as to be implemented within a trapped-ion quantum platform [1]. Numerical simulations and analytical estimations illustrate the feasibility of this simple proposal with current technology, while our approach is fully scalable to a larger number of sites. The use of a quantum correlation function is studied as a signature of the quantum phase transition by quantum simulating the time dynamics, with no need of computing the ground state. The use of machine learning procedure to determine the quantum phase diagram of the model is also explored [2].

[1] Pedro Pérez-Fernández, José-Miguel Arias, José-Enrique García-Ramos y Lucas Lamata, “A digital quantum simulation of the Agassi model”, Physics Letter B 829, 137133 (2022)

[2] Álvaro Saiz, Pedro Pérez-Fernández, José-Miguel Arias, José-Enrique García-Ramos, and Lucas Lamata, “Digital quantum simulation of an extended Agassi model: Using machine learning to disentangle its phase-diagram”, Phys. Rev. C 106, 064322 (2022).

Primary author(s) : Dr. GARCÍA-RAMOS, J.E. (U. Huelva); SAIZ, A (U. Seville); PÉREZ-FERNANDEZ, P. (U. Seville); Dr. LAMATA, L. (U. Seville); Dr. ARIAS, J.M. (U. Seville)

Presenter(s) : Dr. GARCÍA-RAMOS, J.E. (U. Huelva)

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