ECTI

7th European Conference on Trapped Ions

Contribution ID: **123** Type: **Poster**

Investigating entanglement structure on a programmable trapped ion quantum simulator

Tuesday, 26 September 2023 19:30 (2 hours)

Trapped ions are one of the leading candidates for performing quantum simulation, computation, and precision measurements. Entanglement in simulation experiments plays a crucial role in generating exciting quantum many-body states and distinguishes these experimental systems from their classical counterparts. Investigating entanglement in many body systems is extremely valuable to reveal underlying physics, however, investigating it in an experimental platform with a large number of particles is challenging. In our recent work, we investigated entanglement structure on a 51-ion programmable quantum simulator while variationally preparing the ground and excited states of the iconic 1D XXZ Heisenberg model and employing a sample-efficient entanglement Hamiltonian tomography method. We learn a reduced quantum state of 20 qubits in the middle of our 51-ion chain. To our knowledge, this is the largest quantum state reconstruction reported in the literature.

Primary authors: JOSHI, Manoj Kumar (Institute for quantum optics and quantum information, Innsbruck, Austria); Dr KOKAIL, Christian (University of Innsbruck, Austria); Dr BIJNEN, Rick van (University of Innsbruck, Austria)

Co-authors: Mr KRANZL, Florian (University of Innsbruck, Austria); Dr ZACHE, Torsten (University of Innsbruck, Austria); Prof. BLATT, Rainer (University of Innsbruck, Austria); Dr ROOS, Christian (University of Innsbruck, Austria); Prof. ZOLLER, Peter (University of Innsbruck, Austria)

Presenter: JOSHI, Manoj Kumar (Institute for quantum optics and quantum information, Innsbruck, Austria)

Session Classification: Tuesday Poster