Abstract Submitted
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Characterization of Radial 2D Ion Crystals for Quantum Simulation[1] YUANHENG XIE, MARISSA D'ONOFRIO, AJ RASMUSSON, PAULA MADETZKE, EVANGELINE WOLANSKI, PHILIP RICHERME, Indiana Univ - Bloomington — Quantum simulations of complex materials address fundamental problems that cannot be analytically solved due to the exponential scaling of the Hilbert space with increasing particle number. Simulations using trapped ions have had great success investigating one-dimensional quantum interacting spin models, and we seek to extend these ideas to two dimensions by exploiting new crystal geometries in a rf Paul trap. This 2D quantum simulation will allow us to address open questions related to geometric frustration, ground states and dynamics of long-range spin models, and quantum spin liquids. To characterize the variety of different ion geometries, we have measured the ion lattice positions and the frequencies of structural phase transitions for 1D, 2D, and 3D crystal configurations, showing good agreement with numerical predictions. In addition, we have created quantum superpositions of 10+ ions in radial 2D crystals that persist for long coherence times, despite the presence of micromotion in this configuration.

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