Scalable Quantum Computing on A Linear Ion Crystal

Guin-Dar Lin
Dept. of Physics, NTU

Trapped ions have been regarded as one of the most promising platforms for quantum computing realization. Like many other physical systems such as quantum dots and superconducting circuits, the main obstacle lies in its scalability. Particularly for ion traps, adding more ions means that bigger or more complicated traps are needed, and more motional degrees of freedom must be controlled. We discuss the associated difficulties and propose a scalable architecture scheme that stabilizes an ion array of arbitrary length. Instead of shuttling ions, we use optical tweezers to localize a "computing zone" for easy cooling and manipulation. Further, we discuss the quantum simulation prospective associated with large-scale ion arrays.