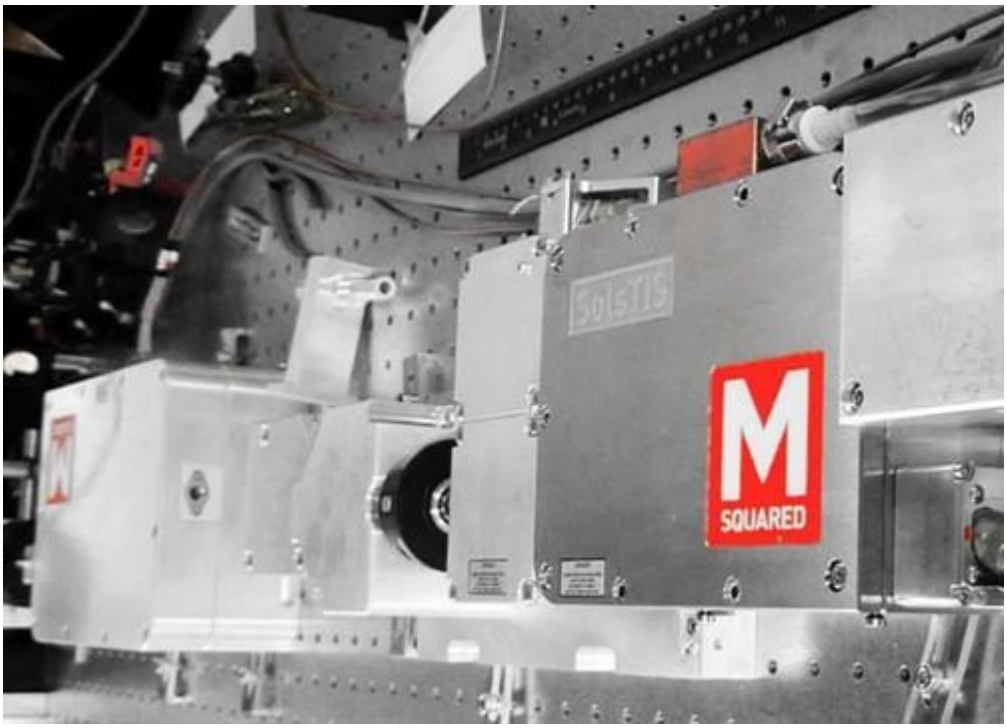
Campbell Group | UCLA | SolsTiS SRX + ECDX

The Campbell Group at UCLA is using a SolsTiS SRX with ECDX for laser cooling of Ytterbium in an experiment that uses trapped ions to perform quantum simulations.

They are seeking a deeper understanding of quantum many-body systems using a new technique known as quantum simulation
– effectively an intermediate method between experimentation and computer simulation.



Our knowledge of the behaviour of quantum many-body systems is currently limited because the interactions of the particles in the system create explosive complexity and the wave function of the entire system holds a vast amount of information which precludes exact calculation or analysis. The world contains many such systems that defy theoretical description and which are also too big for to simulate on a computer. Examples include exotic forms of matter such as spin-liquids and some high-temperature superconductors. The benefits of being able to better understand or analyse such systems include the possibility of new materials and deepening our understanding of the boundary between quantum mechanical and thermodynamic behaviour.

The Quantum Simulation method involves using a controlled, isolated quantum system to model the quantum many-body phenomenon of interest. In the lab the team uses trapped atomic ions to simulate a class of many-body quantum systems called lattice spin models. Each ion simulates the quantum-mechanical spin-1/2 degree of freedom of an electron, and by using appropriately tuned laser fields, they cause the simulated spins to interact in line with imposed rules. By looking at the resulting spectra, dynamics, phase transitions, and states, they hope to learn about systems that have previously been inaccessible.

(Thanks to Dr. Sylvi Haendel).