



Contribution ID: 9

Type: **not specified**

## A strontium quantum-gas microscope in a clock-magic lattice

*Thursday 25 January 2024 12:10 (20 minutes)*

Quantum-gas microscopy is a powerful tool to study individual particle behavior in quantum many-body systems. Realizing those systems with alkaline-earth atoms such as strontium gives rise to exciting phenomena. For example, bosonic strontium in sub-wavelength atomic arrays exhibits strong cooperative effects in atom-photon scattering. The fermionic isotope in the optical lattice enables studying  $SU(N \leq 10)$ -Fermi systems which give rise to exotic magnetic phases beyond the limits of natural materials.

We have realized a strontium quantum-gas microscope which will allow us to study these systems experimentally. We produce quantum-degenerate clouds of bosonic strontium by evaporative cooling in an elliptical sheet beam which provides confinement in a two-dimensional plane. Then, we load the gas into a square optical lattice of 575nm spacing which arises from the four-fold interference of the bow-tie configuration of the lattice beams. Both the lattice and the sheet beam are operated at 813nm, the clock-magic wavelength of strontium, and have a combined power of around 3W. For imaging, we capture photons scattered at the 461nm transition with a high-NA objective while exploiting the narrow 689nm transition for efficient Sisyphus cooling. We obtain high signal-to-noise-ratio single-site resolved images where the atoms can be imaged for several tens of seconds without observing significant hopping. Furthermore, we detect evidence of superfluid  $^{84}\text{Sr}$  in the optical lattice with our quantum-gas microscope.

**Presenter:** BUOB (ICFO - THE INSTITUTE OF PHOTONIC SCIENCES), Sandra

**Session Classification:** Day 1