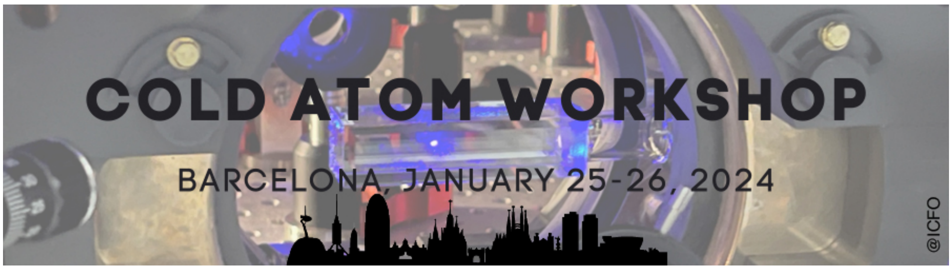

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A strontium quantum-gas microscope in a clock-magic lattice

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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 84Sr in the optical lattice with our quantum-gas microscope.

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

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