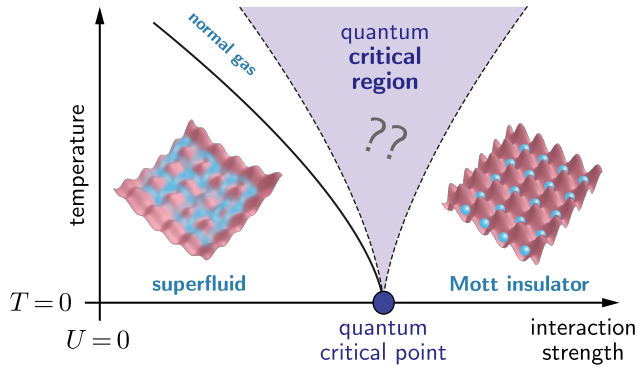


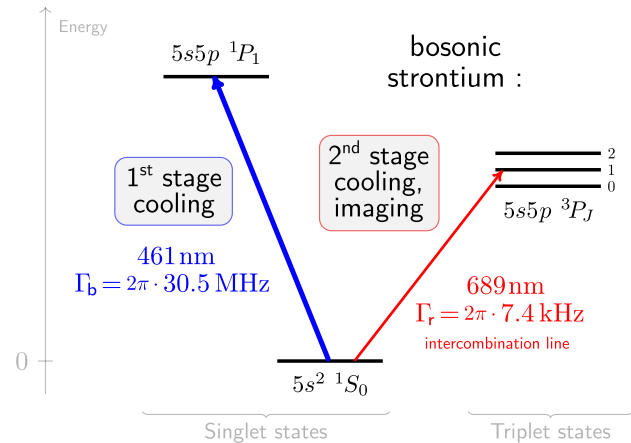
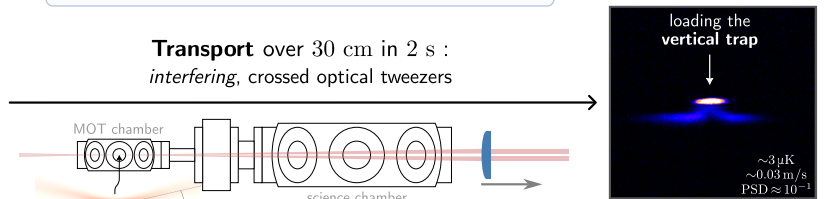
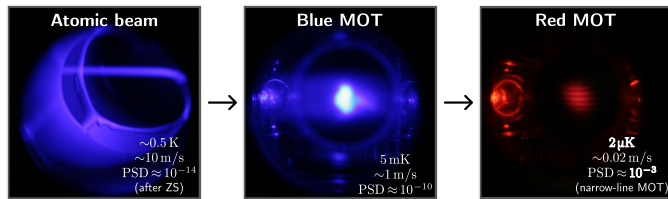
A strontium gas microscope to study the 2D Bose-Hubbard out-of-equilibrium dynamics



2D Bose-Hubbard critical dynamics

- Extent of the quantum critical region ?
- Out-of-equilibrium dynamics in the critical region :
 - $\mathbb{Z}$ quasi-particles. What are the **excitations** then ?
 - **Quench** the system, and look in-situ (n_{ij}) → **microscope**
 - **Propagation of correlations** $\langle n_{\vec{0}} n_{\vec{r}} \rangle_t$: ballistic, diffusive ?
- Effects of long-range interactions ?

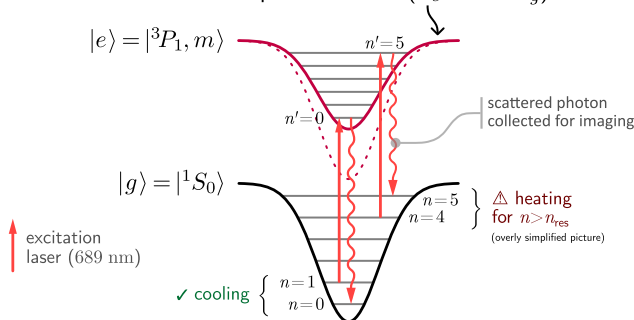
Preparation and microscopy of a degenerate ^{84}Sr gas



The challenge of imaging Sr in a 1064 nm ODT

Combination of difficulties :

- not in the limit $\hbar \omega_{\text{trap}} \gg E_{\text{rec}} (\Delta n|_{\text{spont.}} \neq 0)$
- shallow lattice (few vibrational levels)
- unfavorable ratio of polarizabilities ($\alpha_e \approx 0.75 \alpha_g$)



Solution : circular polarization on all trapping beams to exploit the strong vector polarizability $\Rightarrow$ **magic** condition (or even slightly stronger trapping) can be obtained: $\alpha_e \gtrsim \alpha_g$

