Introduction to strontium Rydberg atoms

- Ultracold strontium atoms: N= 10^9 /2 0.56% a few meV (n bosonic)
- Size and density: 1/e
- Temperature (TOF): 1.5uK (n bosonic)
- High Power: 100mW
- Red Laser locked to ULE cavity (Finesse 250000)
- a few 10GHz
- Narrow-band Red MOT (second stage cooling)
- 9.86%
- Wavelength range: ~318 nm to 322 nm
- Typical available excitation a few 100 Mhz/(V/cm)
- Active cavity locked to 689nm laser [4]
- 830
- Laser setup
- Long-term frequency drift compensated by AOM
- Absorption Imaging of blue MOT
- Blue MOT (first stage cooling)
- Narrow-band Red MOT (second stage cooling)
- Red MOT
- 2
- Side-loaded 2D MOT and 2-stage strontium 3D MOT
- 0.1
- Properties of the experiment:
- Cool on a narrow transition about 10 kHz at 689 nm
- For fermionic isotopes, 1 mHz transition
- No hyperfine structure for the ground state due to I=0
- 800um, ~10^5 atoms (after Yb)
- Time of flight 1 s
- 322nm: 2.07 keV
- 318nm: 2.1 keV
- Ultracold strontium atoms: First BEC without need of evaporative cooling
- Large BECs (10^12 atoms) [1]
- Fast Bose Einstein condensate (BEC) creation cycle time (2 s) [1]
- Scaling laws of Rydberg atoms
- Narrow line Red Laser @689nm
- Laser cooling and excitation of strontium atoms
- Cooling of a hot atomic beam
- Laser cooling scheme based on [7]
- Atom capture in a broadband MOT
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