Strongly Correlated Quantum Matter Group

AG Nägerl

www.quantummatter.at

24th January 2020, Innsbruck

universität innsbruck

FOR 2247

FWF Der Wissenschaftsfonds.

erc

Atoms, Light, and Molecules Innsbruck Physics Research Center

When quantum statistics dominate

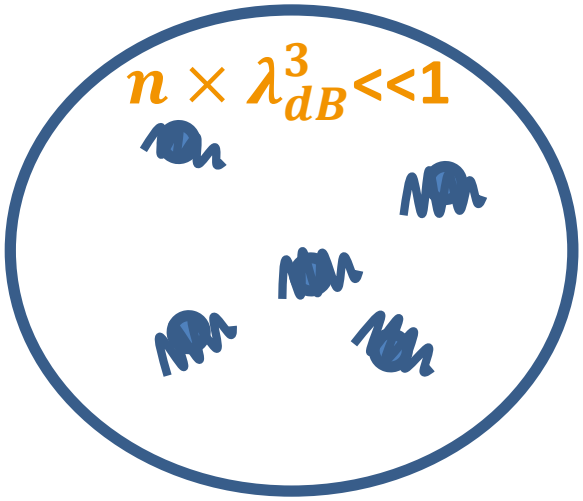
De Broglie wavelength

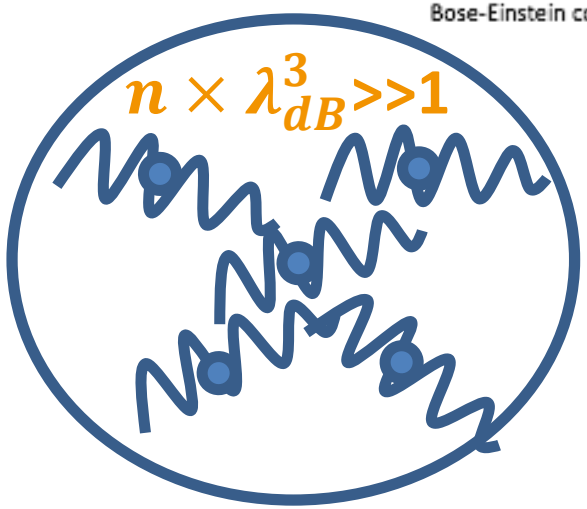
$$\lambda_{dB} = h/\sqrt{2\pi m k_B T}$$

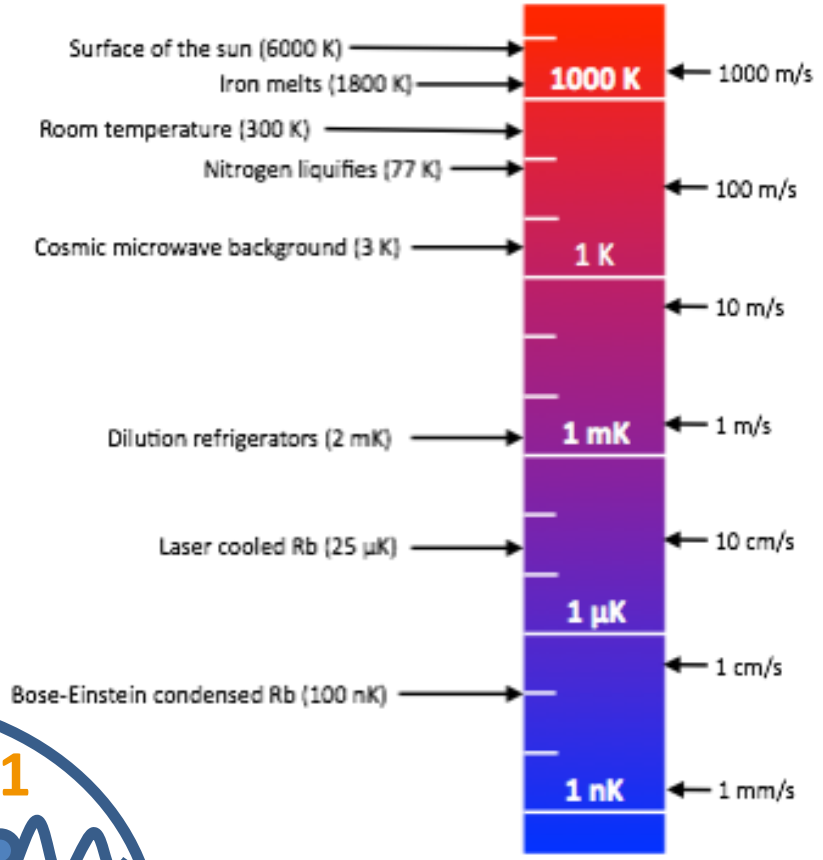
Phase-space density

$$PSD = n \times \lambda_{dB}^3$$

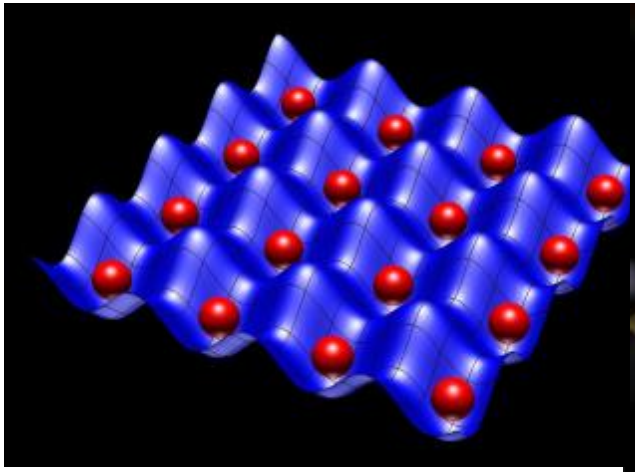
$$PSD \gg 1 \rightarrow Quantum\ Gas$$

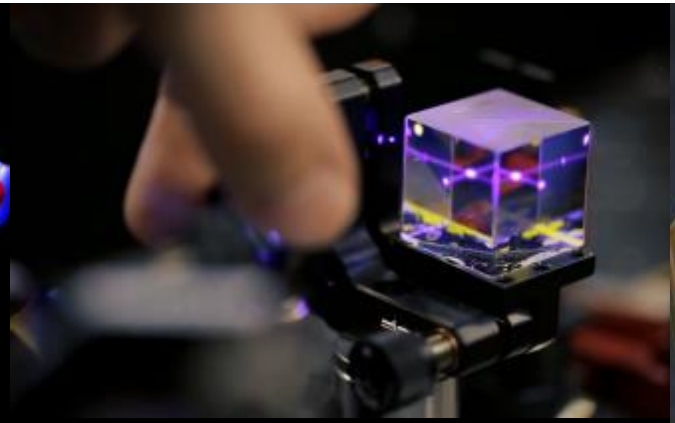


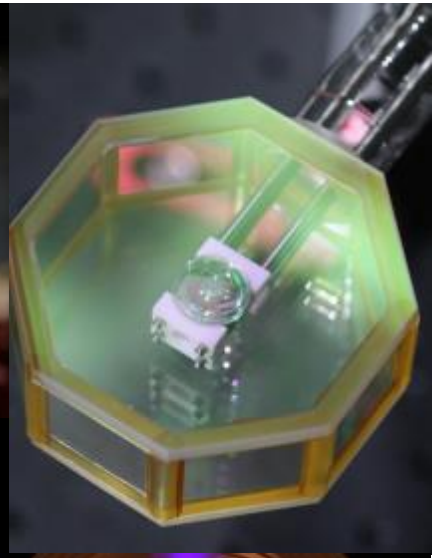


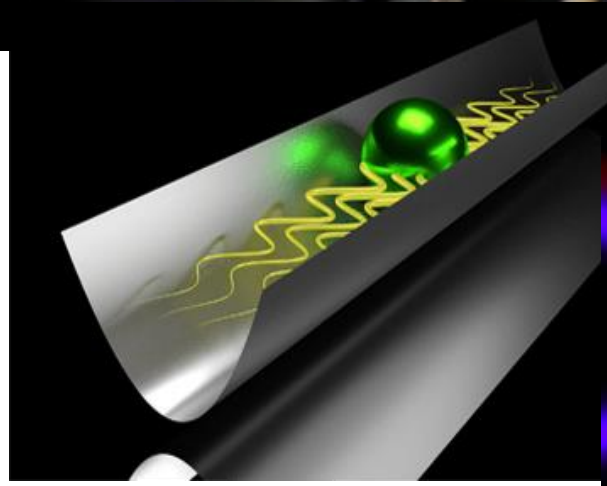


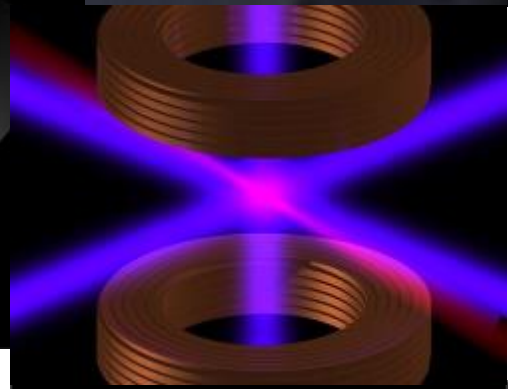
Research Highlights

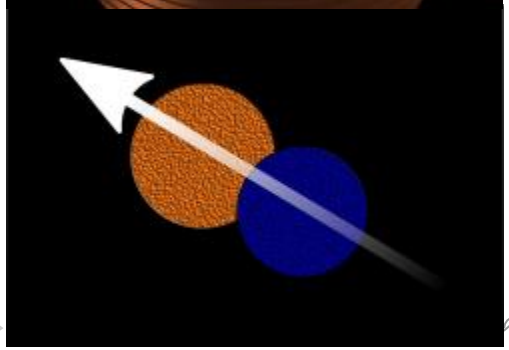






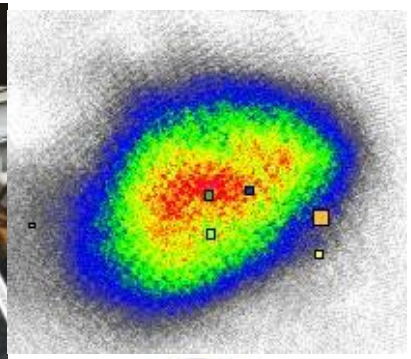


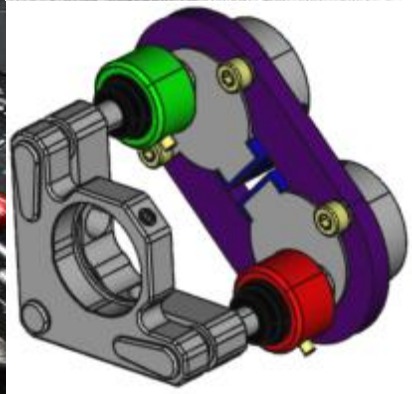




- Quantum simulation
- Many-body quantum dynamics
- Novel quantum phases of matter
- Dipolar quantum gases
- Quantum gas microscopy
- High-precision laser spectroscopy

Bachelor projects





Topics

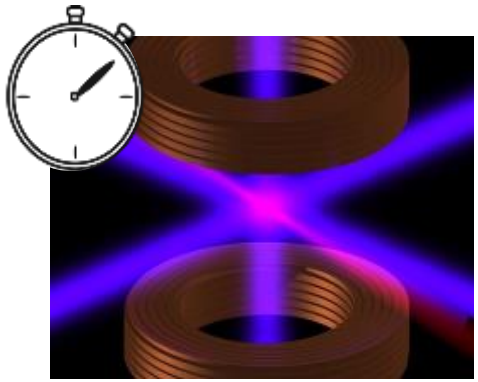
- Imaging of cold atoms
- Automation of opto-mechanics
- Stabilization and characterization

of laser sources

Example

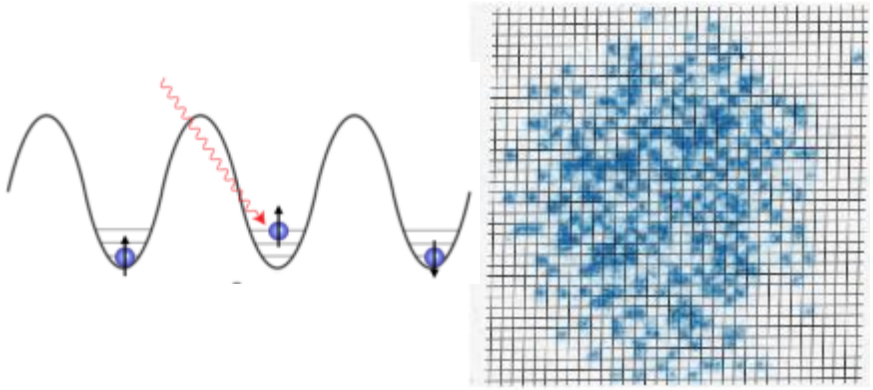
Set-up for atom number stabilization

1) Test of photodiode for atom fluorescence detection
2) Preparation of the readout and trigger electronics
3) Calibration of the photodiode signal on the atoms



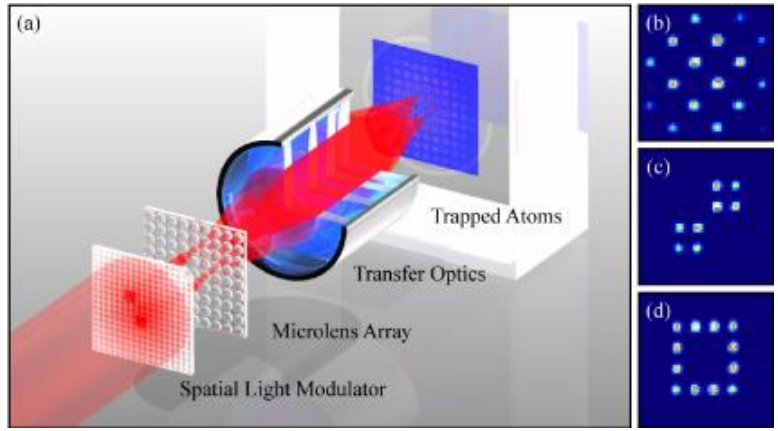
Master projects

- Laser cooling system for high resolution fluorescence imaging



M. F. Parsons *et al.*, Science 353, 1253–1256 (2016)

- Atom manipulation via a spatial light modulator



Schlosser *et.al*. (2011), Quantum Information Processing. 10. 10.1007

- Stable, home-built high power Ti:Saphire laser system

- Many more!