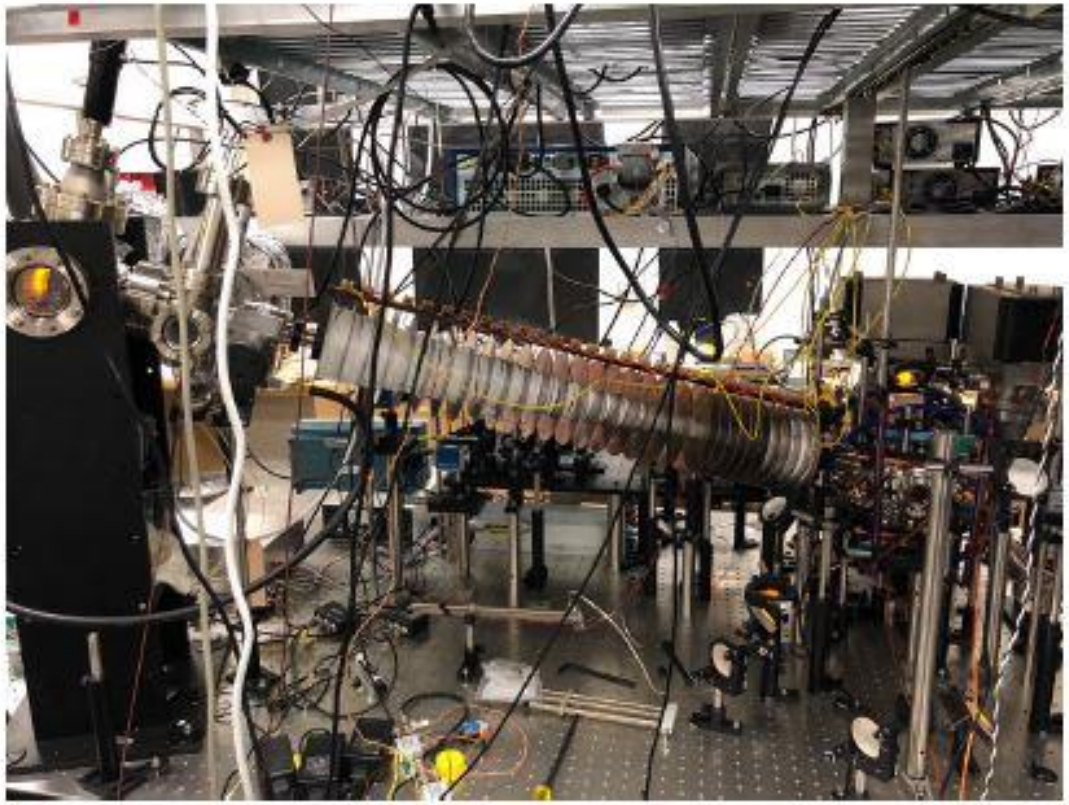
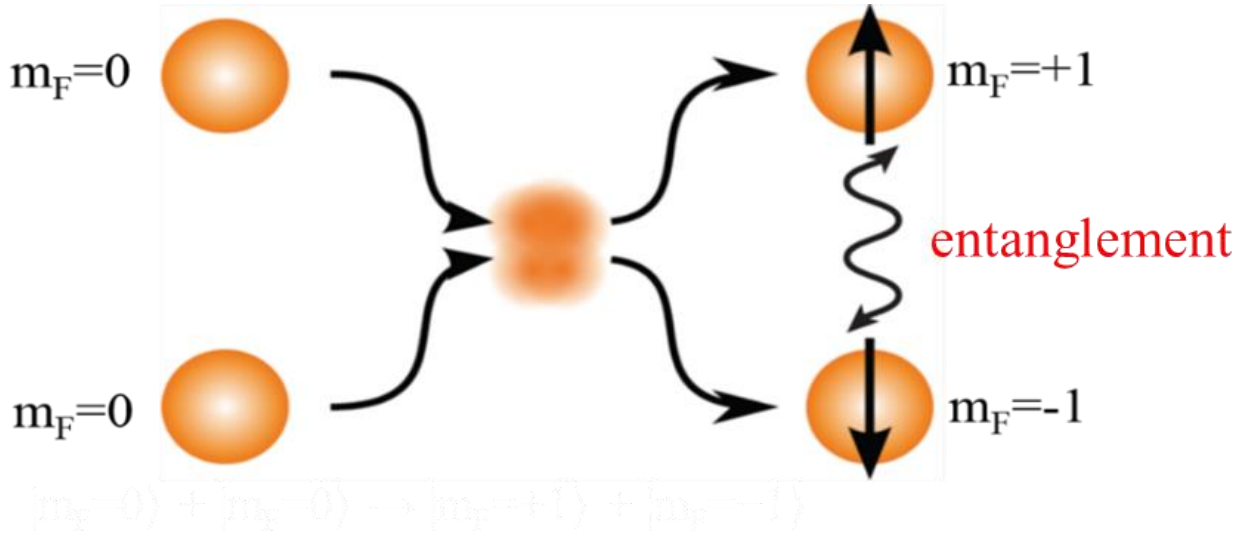


Pulse-Field Ionization Spectrometer for Rydberg Atom Detection in Bose-Einstein Condensate

Chase Heinen
Advisor: Dr. Arne Schwettmann
2020 REU Summer Project

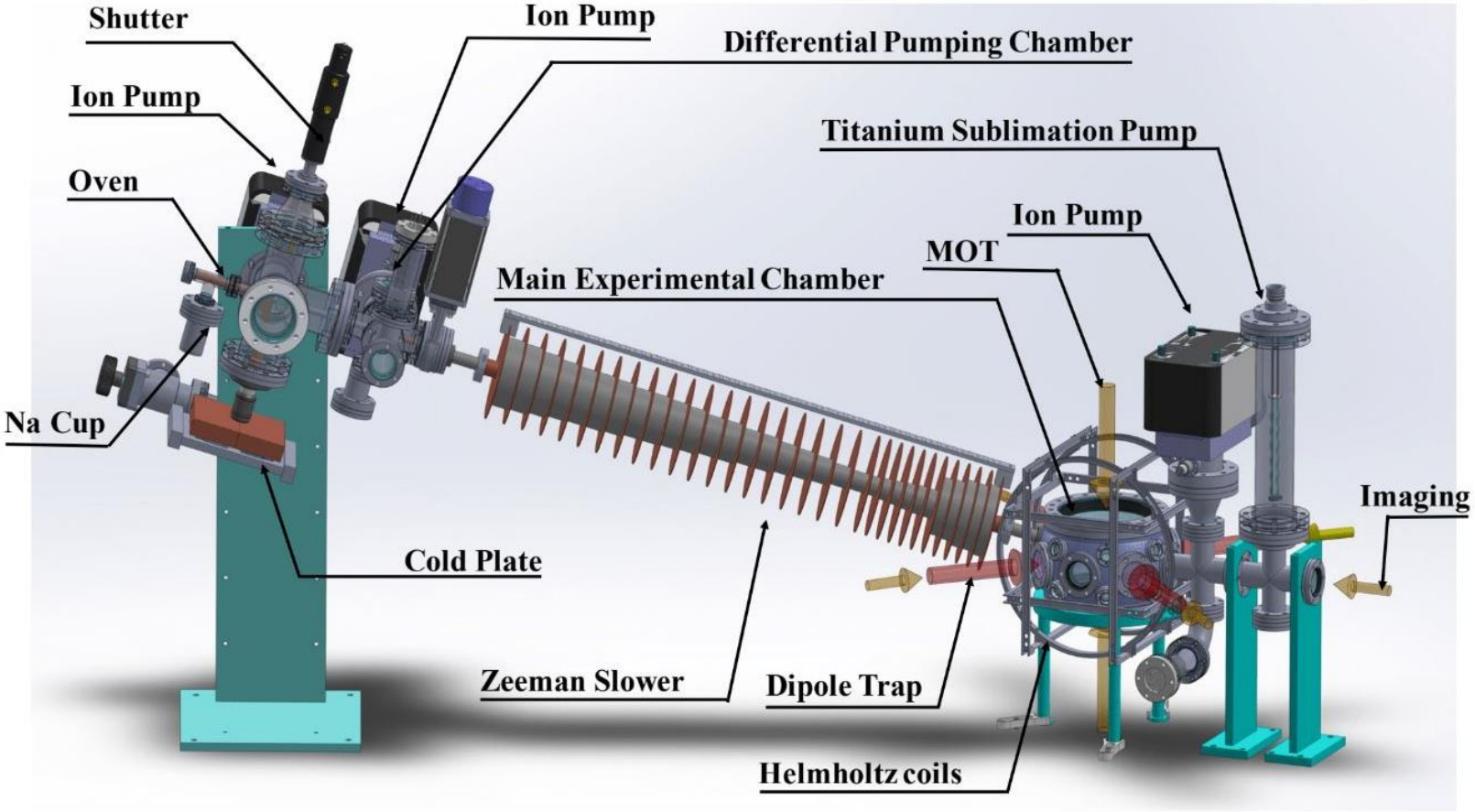
Bose-Einstein Condensate

- State of matter
- Single quantum object
- Ultra cold sodium atoms
- Spin exchange collisions
- Quantum computing and measuring



Taken from, T. Lazarek, Capstone Thesis, OU, 2020

Creation of Bose-Einstein Condensate at OU

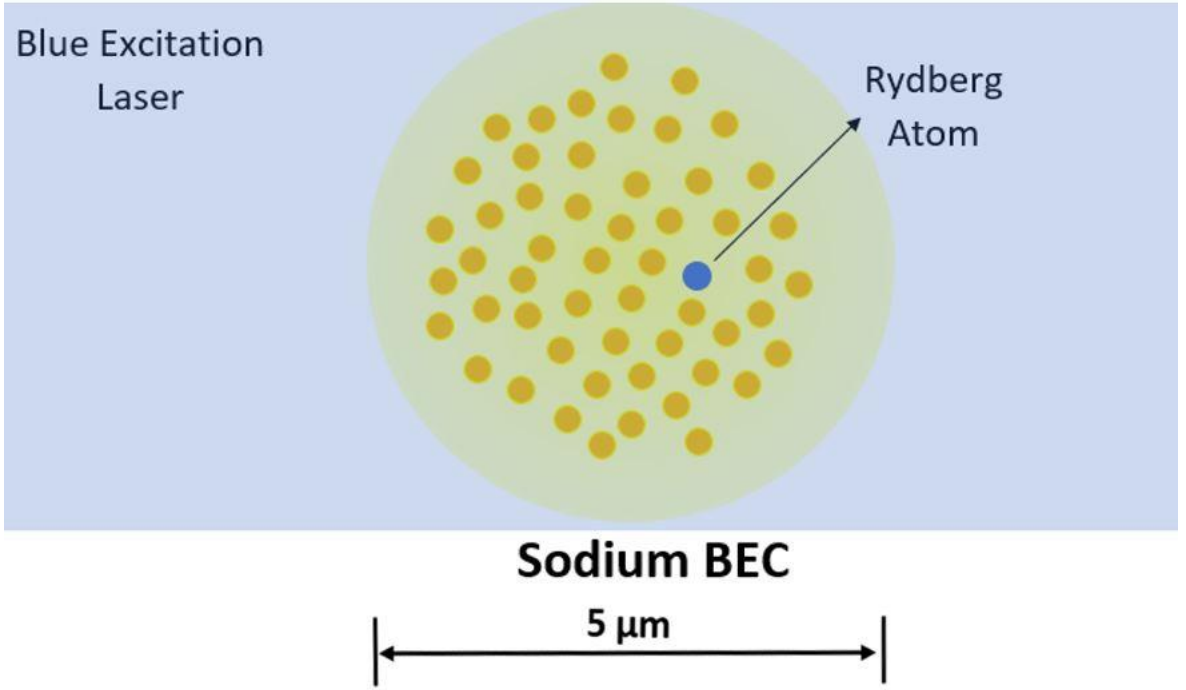


Taken from, T. Lazarek, Capstone Thesis, OU, 2020

- Zeeman slowing
- Magneto-optical trap (MOT)
- Evaporative cooling

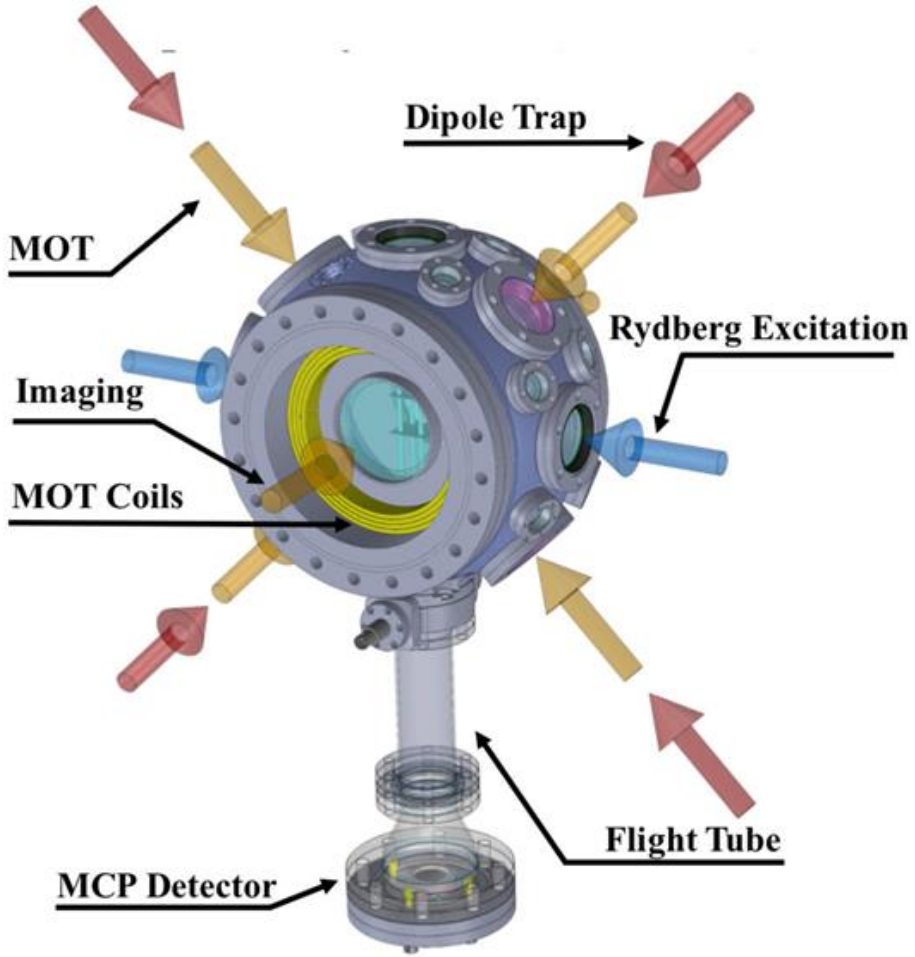
The Next Step: Studying Rydberg Atoms

- Highly excited atoms
- Photoexcitation
- n=60 to n=90
- Rydberg Blockade Effect
- Better understand Bose-Einstein Condensate



Taken from, T. Lazarek, Capstone Thesis, OU, 2020

My Project: Pulse-Field Ionization Spectrometer



Taken from, A. Bhagat, Master Thesis, OU, 2017

- Electric field ionization
- Multi-channel plate detector
- Fit geometrical constraints

Specific Tasks

- Background readings
- Calculate electric fields to ionize Rydberg atoms
- Calculate electric potential in 3D space
- Design plates and mounts in SolidWorks
- Create parts list so the parts can be purchased and assembled at OU

Questions?