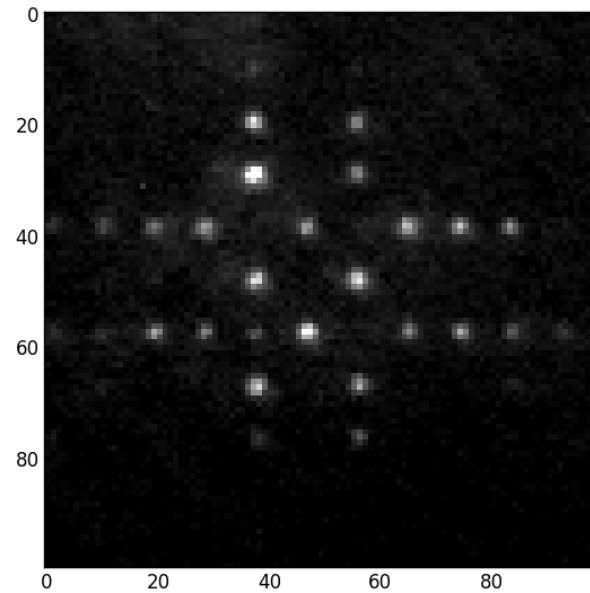
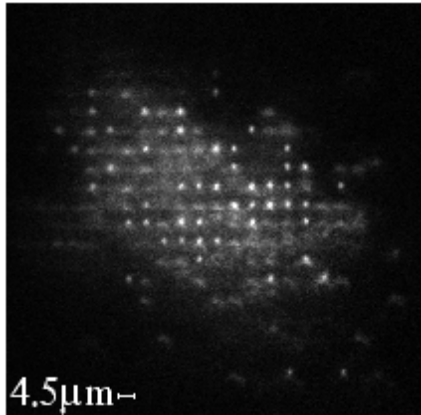
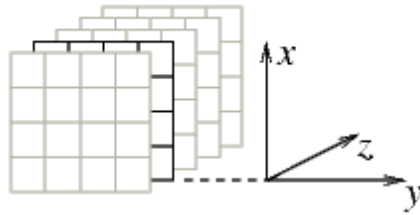
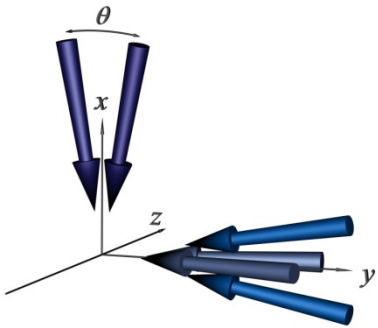




- Penn State Physics Dept.
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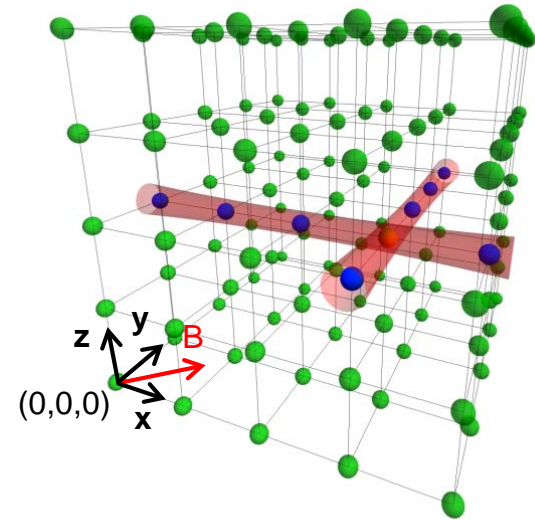


Neutral Atom Quantum Computing



- 3D optical lattice trapping of neutral atoms - many near neighbors
- Mostly cooled to the 3D vibrational ground state
- Ultimately perfect site occupancy.

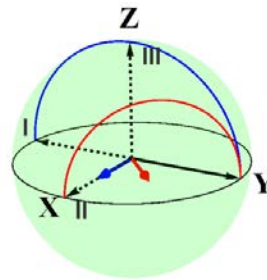
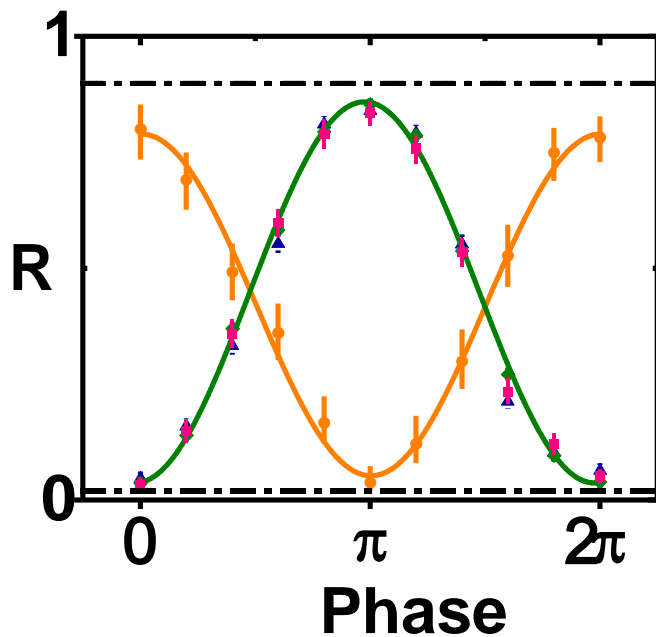
- We have addressed atoms in a 125 site volume (can ultimately be scaled up)
- Our coherence times (T_1) exceed 7 s
- Entangle atoms with Rydberg gates
- We have ideas for error correcting
- Clear path to 25 entangled physical qubits in our current geometry





Status of Experiments

We have demonstrated arbitrary single qubit gates on any site in a 125 site array, while having a negligible effect on non-targeted quantum information. Our low crosstalk addressing techniques may have broad applicability.



- 4 non-coplanar target atoms
- near neighbors
- ▲ line atoms
- ◆ other atoms

Coming soon:

- Single qubit gate fidelities >0.99
- Sorting atoms to obtain perfect site occupancy
- Lossless state detection
- Rydberg gates



- We have natural overlap with neutral atom, ion, and NV-center type qubit systems
- Many of the technical issues related to crosstalk can have similar solutions across these systems
- Some technical issues related to scaling to dozens of physical qubits may be common across all implementations



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