DAMOP - 2010
HOUSTON
Arriving at Houston
Downtown Houston
Hyatt, with 31 floors
Hyatt chandeliers
Sarah’s talk
Mallory’s poster
In between sessions
Laser superheroes
Dave’s poster
Kelly’s poster
Raithel Group
Houston art
Eric’s talk
Andy’s poster
Stefan’s poster

Field Enhancement Cavity for Ponderomotive Optical Lattices
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Abstract
Rydberg atoms trapped in ponderomotive optical lattices (POL) feature a number of peculiarities, such as quantum and classical wavefunction overlap, high motional effective mass, and the ability to support highly excited states that are larger than what can be readily created using conventional optical lattices. Ponderomotive trapping is achieved by focusing a high-intensity, high-repetition-rate laser beam onto a dielectric mirror. This setup will ensure a medium that is above the laser intensity threshold. Here, we apply to the use of Rydberg atoms to demonstrate quantum interference in a high-density target medium. The Rydberg atoms are characterized by their long coherence times, which enables the generation of entangled states and quantum interference. We have tested and characterized a custom cavity with a diameter of about 10 μm using a continuous-wave 1554 nm single-mode fiber. The cavity is coated for efficient reflection using a high-reflection coating scheme. We present examples of how the cavity can be used in future optical coherence experiments.

Objectives
- Design and fabricate a custom cavity
- Characterize and test the optical behavior of the cavity
- Investigate the stability and coherence of the cavity
- Compare different cavity selection methods
- Deploy this custom cavity for experiments in an ultra-high vacuum environment

Construction of the Custom Mirror Mount

- Mirror setup: 20 cm radius of curvature
- Gold mirror with 90% reflectivity
- Fabricated at the University of Michigan

- Mirror are placed in a high vacuum chamber, and the vacuum is created using a two-step process. In the first step, the mirror is placed in the cavity mount, and the vacuum is created using a large vacuum pump. Then, the cavity is sealed in the chamber, and the vacuum is created using a smaller vacuum pump. The vacuum is created using a two-step process. In the first step, the mirror is placed in the cavity mount, and the vacuum is created using a large vacuum pump. Then, the cavity is sealed in the chamber, and the vacuum is created using a smaller vacuum pump.

- Mirror are aligned using a three-axis alignment system, and the alignment is verified using a laser interferometer. The mirror is then sealed in the vacuum chamber, and the vacuum is created using a second vacuum pump. The vacuum is created using a two-step process. In the first step, the mirror is placed in the cavity mount, and the vacuum is created using a large vacuum pump. Then, the cavity is sealed in the chamber, and the vacuum is created using a smaller vacuum pump.

Summary
The high-quality vacuum environment created using the cavity mount enables the observations of various quantum phenomena, such as quantum interference and entanglement. The cavity is an essential tool for quantum computing and quantum communication applications.
Houston sunrise and Minute Maid Park, from the roof of the Magnolia