

Title of Research Fellow Project: Optimization of laser design with 3D printing

Faculty/Staff Supervisor: Erik Brekke

Description of Research Project: This project will involve the optimization of the design for a frequency controlled laser. The design and construction will be done using a combination of components purchased and constructed, including 3D printing techniques, working towards implementation on an optical table. Laser control will be understood through stimulated emission, electronic control, and optical feedback. We will explore several different possibilities and determine which methods are most successful in achieving the efficient and convenient design.

Description of Student Opportunity: The student will learn the basics of experimental design and laser control. This will include optics and atomic energy levels, as well as design skills in CAD for 3D printing. This will then enable a laser design to be implemented and optimized with frequency control to enable atomic transitions. The student will analyze the characteristics of several possible designs, and then optimize the systems for interaction with atoms.

Benefits to the Student: This project would benefit the student by allowing them to be involved in exciting research, increasing their exposure to and interest in system engineering and current physics fields. In addition, they would receive guidance from faculty, helping with both physics knowledge and experimental technique.

Benefits to the Supervising Faculty/ Staff Member: The research done during this project would lead to the development and implementation of a new laser system that I plan to use in future projects.

Research Fellow Qualifications (major, skill set, technology, etc.)

- Background in high school physics and calculus
- Ability to work independently
- Ability to do hands on work
- Experience in a laboratory setting
- Patience
- Enthusiastic