

Interim Report

SPS Undergraduate Research Award Saginaw Valley State University “Laser Cooling & Trapping of Rubidium Atoms”

The Saginaw Valley State University SPS Chapter has begun the design and construction of a magneto-optical trap (MOT) which will be used for the cooling and trapping of rubidium atoms. The completion of this project will provide an enhanced learning experience at SVSU in two ways. The primary benefit will be to allow senior-level undergraduate students to perform independent research. Secondly, the apparatus will offer upper-division classes and laboratories hands-on experience in experimental atomic physics. Here, we will summarize our progress on this project.

Our advisor is Dr. Ming-Tie Huang. Our research team presently consists of physics majors Christopher Hopper, Khai Huu Nguyen, and Loc Huynh.

The diode laser system is operational and working properly. Hyperfine transitions of the ^{85}Rb and ^{87}Rb D_2 resonance have been observed. A spectrum analyzer has been constructed and is working properly. With our award money, we have purchased six quarter-wave plates necessary for our project, which is listed below:

Company	Item	Price
Edmond Scientific	Six $\lambda/4$ wave plates	\$2148

In addition to purchasing these items, we have designed and purchased a vacuum chamber system with the needed components. This vacuum system includes a chamber with anti-reflection coated windows, vacuum pumps and gauges, and rubidium Getters from SAES Getters Group. We anticipate the chamber and components to arrive in the next couple of weeks, at which time we will begin assembly of the system. A support frame for the chamber has also been designed and is currently being constructed. In the mean time, our team will continue working toward locking the laser to the hyperfine transition frequency, controlling the laser beam polarization, and assembling the second diode laser as the re-pump beam.

Once the system is completed, we will be able to move forward with our objective of trapping Rubidium atoms.