

MAGIS-100 Laser Transport Vacuum Simulations and LED Atom Tracker
Jordan Aasman, CCI Program
Mentors: Linda Valerio, Jesse Batko, Beth Klein

Abstract

MAGIS-100 is an experiment using atom interferometry to measure fluctuations in the travel of strontium atoms along a 100m vacuum chamber. The laser travels through a laser transport system (LTS) before going down the chamber. One project was to conduct vacuum simulations on the LTS to ensure it meets the experimental pressure requirement of 10^{-11} torr. This was done by characterizing the pressure profile with variations in pump size, pump spacing, and orifice size. The final design contained three ion pumps and adjusted orifice size. The other project was to design an LED atom tracker that shows the status of the strontium atoms in the 100m shaft. An Arduino Uno was programmed using classical physics formulas to direct the RGB LED strips to flash in sync with the travelling atoms. The requirements for powering and connecting the hardware were calculated and recommendations for scaling the system to 100m were made.