Abstract

When light from stars and other celestial objects passes through the atmosphere at a large angle relative to vertical, it is deflected by the atmosphere as if it were passing through a prism (fig. 1). This “rainbow” effect spatially spreads the light so it will not all enter a narrow slit of a spectroscope, making it difficult to collect meaningful spectral data about a light source of interest. The ADC project team developed a telescope sub-assembly that corrects this by adjusting the angular alignment of two circular compound prisms (fig. 1).

Design Concept and Prototype

The goal for the ADC project was to develop a functional prototype for prism positioning. After initial concept exploration, a design was selected for its expected achievement of the requirements, simplicity, ease of assembly, and maintenance (fig. 2). The design team was not involved in an optics solution, but focused on precision mechanical positioning.

The design team created a prototype (fig. 3) according to the final developed design. Multiple high tolerance parts were made by group members in the COE machine shop and more intricate parts were machined by a sourced machine shop.

Control System and Software Interface

The control system features two NEMA-17 stepper motors to position the prisms and two encoders to track the prisms. Two Hall effect sensors detect a magnet on each of the prism holders to help determine their real positions in the 2:1 drive train.

Using LabView, these features are able to rotate each prism to any angular position with an accuracy better than 1,000 arcsec (~0.27).