



Adjustable High-Resolution Spectrograph Design for Celestron CPC Series Telescopes: An Engineering Approach

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Abstract. Spectroscopy is crucial in astronomy, offering a deeper understanding of celestial bodies by dissecting light into its component wavelengths. High-resolution spectrographs reveal the intricate characteristics of atoms and molecules within celestial objects. Integrating standard spectrographs with alt-azimuth mount telescopes poses mechanical coupling challenges due to limited space between the telescope and the mount. This paper details the design and construction of a compact, high-resolution spectrograph for the Celestron CPC series telescopes, specifically the CPC 800, CPC 925, and CPC 1100 models. The spectrograph is engineered to fit each telescope's parameters, such as aperture size (8", 9.25", and 11") and focal length (2032 mm, 2350 mm, and 2800 mm, respectively), ensuring compatibility with their optical specifications. A custom-designed mounting system, developed through advanced mechanical engineering principles, ensures precise alignment and stability, accommodating various focal lengths and optical configurations. Key features include an adjustable slit mechanism, collimating mirror, diffraction grating, and focusing lenses and CCD camera. This design facilitates easy adjustment across different CPC telescopes without compromising performance. The research employs mechanical design principles and manufacturing processes to ensure precision and reliability for telescope balance. This pioneering work in adjustable spectrographs for CPC telescopes enhances observational capabilities, providing a valuable tool for education and research with broad marketability.

Keywords: Spectrograph, Telescopes, Mechanical Design, Alt-azimuth Mount, CPC Series.