



भारतीय खगोलभौतिकी संस्थान
INDIAN INSTITUTE OF ASTROPHYSICS
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स्नातक अध्ययन मंडल **Board of Graduate Studies.**

Integrated M.Tech.- Dissertation Student Seminar

Speaker: Ms. Maithilee Deshpande

Title: Replicated Spectroscopic Array: Design of Echelle Spectrograph and Focal Plane Unit for Array Concept

सार Abstract

With the advent of fiber-based echelle spectrographs, using several smaller-aperture telescopes to feed a high-resolution spectrograph has become a viable spectrographic configuration. This work lays the groundwork for building the Replicated Spectroscopic Array concept, demonstrating that high-resolution spectroscopy can be achieved with compact, cost-effective echelle spectrographs connected to an array of small-aperture telescopes. We present the design of a compact, fiber-fed, cross-dispersed echelle spectrograph for the Replicated Spectroscopic Array (RSA) approach. We have developed an optical design for this spectrograph using a double-pass optical setup in Zemax, along with designs for fiber acquisition and injection units. Gratings and cross-dispersion parameters were derived from analytical modeling of echelle spectrographs. A 79-lines/mm echelle grating with a 75° blaze angle was tested for double-pass configuration, and a 79-lines/mm echelle grating with a 63° blaze angle was tested for single-pass configuration in Zemax modeling. A double-pass prism cross-disperser was adopted over a single-pass, delivering approximately half the RMS spot radius and significantly better aberration correction. A custom 6-element double-Gauss optical assembly was used as a collimator/camera in a spectrograph layout for better aberration control. The spectrograph is designed to be workable across a range of fiber inputs. With a standard $50\text{ }\mu\text{m}$ virtual slit, the design delivers a median resolving power of $R = 22,233$ across diffraction orders 35–54, covering 449–708 nm on a $36\times 24\text{ mm}$ detector. Feeding a $9\text{ }\mu\text{m}$ few-mode fiber yields an effective slit of $22.5\text{ }\mu\text{m}$ and a resolving power of approximately $R = 49,700$ — suitable for bright-target RV surveys.

शुक्रवार Friday, 24 जुलाई July 2026

प्रेक्षागृह Auditorium

Time: 11:00 Hours

सभी का स्वागत है All are welcome.