

FIVE FUNDED* RESEARCH POSITIONS - 2019

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SAAO
South African
Astronomical Observatory

ASTRO-INSTRUMENT projects

Ph.D. Position-5:

Design, development and commissioning of a fibre slit-mask integral-field unit for SALT prime-focus spectrograph

Funding Period: (2019-2021)

Funding Amount: R180 000pa

Requirement: Masters program in astronomy a closely aligned field is required.

Closing Date: 22 February 2019

key words: *astronomical instrumentation; slit-mask integral-field unit lead.*

Description: We seek applicants to undertake a three-year Ph.D. program *co-leading* the design, construction and commissioning of a two-dimensional fibre array (integral field unit, or IFU) for the Southern African Large Telescope prime-focus spectrograph. The IFU will be designed to achieve the highest possible spectral resolution while delivering photon-limited performance for the mapping and study of galaxy kinematics traced by stars and ionized gas. The specific design will be driven by a science case developed by the Ph.D. candidate and Bershady. The instrument will be suited for follow-up of relatively nearby galaxies observed in HI-imaging surveys with MeerKAT for analyzing their stellar populations, dark-matter content, and dynamics. This relatively simple and small instrument is ideal for candidates who wish to learn about instrumentation and who have plans for a career path in industry or a research institution.

Project scope: The Ph.D. project will include (1) high-level design of the fibre slit-mask IFU based on specific science requirements established by the candidate and their supervisor; (2) implementation and fabrication of opto-mechanical assemblies, mounts and fixtures based on an existing design for a companion IFU being built at the University of Wisconsin (UWisc); (3) establishing a fibre-polishing protocol to ensure high throughput and low focal-ratio degradation; (4) procurement, assembly and termination of fibres in the slit-mask, including their alignment and bonding fibres to micro-prisms; (5) designing the interface between the IFU and the fibre-optic test facility (FTF); (6) co-mentoring the honors/bursary student and masters student on the development and calibration of the FTF; (7) commissioning the instrument on-sky in the Robert Stobie Spectrograph on SALT to complete a pilot program demonstrating science performance; (8) completing a written dissertation describing both instrument and pilot observations suitable for publication.

The student will work closely with Prof M Bershady (SAAO SARCHI), his research team of observers and instrumentalists (including bursary and Masters students building a fibre-optic test facility), members of the SAAO Machine Shop, as well as other members of the SAAO technical and science staff. The student will have the opportunity to travel to UWisc where the companion slit-mask IFU is being made and observe with existing IFUs.

Requirements: Applicants need not have a background in astronomical instrumentation or fibre optics; knowledge of astronomy and geometric optics at the undergraduate level is required; completion of a Masters program in astronomy a closely aligned field is required; and an interest to learn and undertake laboratory skill with fibre-optics and opto-mechanics is required.

***Professor Bershady** is a South African Research Chair (**SARCHI**) located at SAAO, and cross-appointed at the University of Cape Town and the University of Wisconsin-Madison. **Inquiries and applications should be sent to mab@sao.ac.za.**