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Notice for the PhD Viva Voce Examination

Mr Shridharan B (Registration Number: 2071201), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Wednesday, 17 January 2024 at 2.00 pm in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Study of Early-Type Emission-Line Stars in the Galaxy Using Lamost and Gaia**
Discipline	:	**Physics**
External Examiner (Outside Karnataka, Maharashtra And Uttar Pradesh)	:	**Dr Saurabh Sharma** Scientist E Aryabhatta Research Institute of Observational Science (ARIES), Nainital – 263002 Uttrakhand
External Examiner (Within Karnataka, Maharashtra and Uttar Pradesh)	:	**Dr Joe Philip Ninan** Dr Joe Philip Ninan Reader Department of Astronomy & Astrophysics TIFR, Homi Bhabha Road Mumbai – 400005 Maharashtra
Supervisor	:	**Dr Blesson Mathew** Associate Professor Department of Physics and Electronics School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru
Date: 05 January 2024

ABSTRACT

Studying massive emission-line stars (ELS), particularly O, B, and A spectral types, is vital for understanding the disk formation and evolution process. They provide insights into accretion processes, material conditions, and stellar evolution. The first theme of the thesis identifies and characterizes hot ELS from surveys like LAMOST and Gaia DR3. Using LAMOST DR5, we automated Python to identify 3339 unique sources with Hα emission in 4138 spectra. We differentiated HAeBe and Classical Ae/Be stars based on IR excess from 2MASS and WISE data, resulting in 1089 Classical Be stars, 233 Classical Ae stars, and 56 Herbig Ae/Be stars. This homogeneous emission-line dataset enables detailed investigations. We compared Gaia DR3 astrophysical parameters with LAMOST, obtaining consistent classifications and updating the conversion relation for pseudo-equivalent width to observed equivalent width.

As the second theme of the thesis, we analyzed the X-Shooter spectral database to study HAeBe stars' circumstellar medium via spectral features and near-infrared excess. Most young massive stars exhibited emission in higher-order HI lines, while stars with lower-order lines had lower effective temperatures and ages of 5-10 Myr. The emitting medium was optically thick, with line ratios independent of spectral type. HAeBe stars displayed electron density values of 109 to 1011 cm-3. Furthermore, early HBe stars were categorized into intense and weak groups based on Hα and near-infrared index (nJ-H). Intense HBe stars had active circumstellar environments, evident from inner disks, high near-infrared excess, strong Hα equivalent width, and various emission lines. Weak HBe stars showed signs of a cleared inner disk and a more evolved circumstellar environment. We identified 44 intense HBe star candidates from Gaia DR3, which require further spectroscopic investigation for insights into inner disk evolution in early HBe stars.

Keywords: Emission-line stars, Spectroscopy, pre-main sequence stars, accretion processes, Case-B recombination

Publications:

1. Shridharan B., Mathew B., et al., Disentangling the two sub-populations of early Herbig Be stars using VLT/X-Shooter spectra, Astronomy and Astrophysics, accepted for publication, 2023. doi: https://doi.org/10.1051/0004-6361/202346811
2. Shridharan B., Mathew B., et al, HI line analysis of Herbig Ae/Be stars using X-Shooter spectra, Journal of Astrophysics and Astronomy, 44, 62, 2023. Doi: https://doi.org/10.1007/s12036-023-09952-w
3. Shridharan B., Mathew B., et al., Emission line star catalogues post-Gaia DR3 – A validation of Gaia DR3 data using the LAMOST OBA emission catalogue, Astronomy and Astrophysics, 668, A156, 2022. Doi: https://doi.org/10.1051/0004-6361/202244353
4. Shridharan B., Mathew, B., et al., Discovery of 2716 hot emission-line stars from LAMOST DR5, Research in Astronomy and Astrophysics, vol. 21, no. 11, 2021. doi: https://doi.org/10.1088/1674-4527/21/11/288