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Notice for the PhD Viva Voce Examination

Mr Suman Bhattacharyya, Registration Number: 2170195, PhD Scholar at the Department of Physics and Electronics, School of Sciences, CHRIST (Deemed to be University) will defend his PhD thesis at the public viva-voce examination on Monday, 11 May 2026 at 02.00 pm in Room No. 05, Ground Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis	:	**Binary Interactions and Transient Circumstellar Disks in Be Stars: A Multi-Epoch Spectroscopic and Photometric Study**
Discipline	:	**Physics**
External Examiner - I	:	**Dr Ravinder K Banyal** Professor Department of Astronomy Instrumentation and Exoplanet Science Indian Institute of Astrophysics 2nd Block, Koramangala Bengaluru - 560034 Karnataka
External Examiner - II	:	**Dr Santosh Joshi** Scientist F Aryabhatta Research Institute of Observational Sciences Manora Peak, Nainital - 263001 Uttar Pradesh
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 (Academics)

Place: Bengaluru
Date: 27 April 2026

ABSTRACT

A classical Be star is a massive B-type main-sequence star characterized by a geometrically thin, equatorial, gaseous decretion disk orbiting the central star. Emission lines in Be star spectra offer important diagnostics for understanding the geometry, kinematics, and evolution of the circumstellar disk. Despite extensive studies, the mechanism driving disk formation—the "Be phenomenon" — remains poorly understood. Frequent binarity, often involving compact companions, further complicates disk evolution, particularly in Be/X-ray binary (BeXRB) systems. This study investigates a large sample of Be stars through long-term optical spectroscopic monitoring combined with multi-wavelength and statistical analyses. Two complementary case studies were conducted on MAXI J0709–159 and HD 249179. For MAXI J0709–159, multi-wavelength observations following its 2022 X-ray flare reveal an evolved Be star (Teff ≈ 20,000 K), displaying correlated He I emission and X-ray variability, supporting its classification as a BeXRB likely hosting a neutron star. In contrast, HD 249179 exhibits cyclic Hα variability (−3.2 to −32.7 Å) and multi-periodic photometric changes, confirming its classification as a classical Be star with no strong X-ray interaction. Additionally, over 21,000 Hα spectra from 213 classical Be stars (average coverage ~19 years) were analyzed using adaptive time-binning, Monte Carlo error estimation, and dynamic phase classification to quantify variability cycles. Results show that Be stars spend about 35.6 ± 0.8 % of the time in quasi-stable states, with growth and decay phases contributing 30.7 ± 0.9 % and 33.7 ± 0.9 %, respectively. These findings provide one of a statistical overviews of long-term disk variability, explaining the timescales of disk formation and dissipation.

Keywords: Be star, BeXRB, spectroscopy, emission lines, time series analysis, light curve, variability

Publications:

1. **Bhattacharyya, Suman.**, Mathew, Blesson., Ezhikode, Savithri H., Muneer, S., G, Selvakumar., G, Maheswer., Arun, R., Anilkumar, Hema., Banerjee, Gourav., Kumar, Pramod., Kartha, Sreeja S., Paul, K. T., \& Velu, C.; Decoding the X-Ray Flare from MAXI J0709-159 Using Optical Spectroscopy and Multiepoch Photometry.; 2022; ApJL; 933; 2; L34
2. **Suman Bhattacharyya**, Blesson Mathew , Gourav Banerjee , Sindhu G , S. Muneer , S. Pramod Kumar and Santosh Joshi; Insights on the Optical and Infrared Nature of MAXI J0709-159: Implications for High-Mass X-ray Binaries; 2024; Bull. Soc. R. Sci. Liège; 93(2), 636-647