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Investigating the Polarimetric and Spectral Dynamics of Cygnus X-3 through IXPE Observations

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X-ray binaries are key laboratories for studying accretion and jet ejection mechanisms in strong gravitational fields. Among them, Cygnus X-3 stands out due to its distinctive properties and long-standing observational interest. In this talk, I will present results from the second and third observations of Cygnus X-3 by the Imaging X-ray Polarimetry Explorer (IXPE), focusing on the evolution of its spectral and polarimetric characteristics. Both observations reveal significant polarization, with notable differences in spectral shape and polarization behavior, offering a dynamic view of the system across time.

A particularly novel aspect of this study is the exploration of a possible correlation between the observed polarization and the orbital phase of the source, with an emphasis on the variability seen during the third observation. The results suggest a complex interplay between orbital geometry and emission properties, with the inferred geometry appearing especially peculiar for a system of this kind. Unlike more typical black hole binaries in hard state that feature a compact corona as the primary emission region, Cygnus X-3 appears to involve an outflow, responsible for reflection, which fundamentally alters the interpretation of the polarimetric signal. As such, these findings may not be directly applicable to standard black hole binary systems, further underscoring the unique nature of this source.

These findings contribute to a deeper understanding of black hole accretion physics and jet formation, and they underscore the potential of X-ray polarimetry to probe the high-energy behavior of compact binary systems.

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