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Variability of X-ray polarization of Cyg X-1

In this talk, I'll present the results of a comprehensive, 3-year-long multiwavelength polarimetric campaign on the prototypical black hole X-ray binary Cygnus X-1, conducted between 2022 and 2024. Using data from the Imaging X-ray Polarimetry Explorer (IXPE), we measured X-ray polarization 13 times across both hard and soft spectral states. We found that the polarization degree in the hard state is significantly higher —about 4% compared to 2.2% in the soft state —and increases with energy in both cases. At the same time, being on average well-aligned with the radio-jet orientation, as well as with optical and radio polarizaiton angle (PA), the X-ray PA showed long-term variations with amplitude of about 5 deg. By combining hard state observations, we find indications of orbital variability of the X-ray polarization. This variability may arise from the scattering of the central source X-ray emission by the circumstellar medium. The orbital profile of these variations requires the presence of asymmetry of scattering/emitting medium. Future high-precision X-ray polarimetric observations of Cyg X-1 with high temporal resolution are encouraged to shed light on the nature of this variability.

Contribution

Oral talk

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