

N03a Mass-Capture Rate by the Neutron Star in Be/X-Ray Binaries

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The Be/X-ray binaries, the dominant subclass of high-mass X-ray binaries, consist of a Be star (i.e., a B star with a decretion disk) and a neutron star. The orbit is wide and eccentric. Most of the Be/X-ray binaries exhibit only transient X-ray activity, features of which imply a complicated and strongly orbital-phase dependent interaction between the Be decretion disk and the neutron star.

In this paper, we report the results from three dimensional SPH simulations of the interaction between the Be disk and the neutron star in Be/X-ray binaries, particularly the orbital-phase dependence of the mass-capture rate by the neutron star, for a range of orbital parameters. Our simulations show that the Be disk is truncated at a radius smaller than the periastron distance except for systems with extremely high orbital eccentricity, so in general there is no passage of the neutron star through the disk. Then, the mass-capture rate by the neutron star is sensitive to both of the orbital eccentricity and the angle of misalignment between the Be disk and the orbital plane, and depends strongly on the binary phase. It has a higher peak and stronger phase-dependence in the case of higher eccentricity. For misaligned systems, there are two peaks per orbit in the mass-capture rate. The secondary peak becomes more remarkable for larger angle of misalignment. These features are consistent with observed X-ray light curves of some Be/X-ray binaries.