



The fate of Cyg X-1: an empirical lower limit on BH-NS merger rate

Krzysztof Belczynski, Tomasz Bulik, Charles Bailyn

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The recent distance determination allowed precise estimation of the orbital parameters of Cyg X-1, which contains a massive 14.8 Msun BH with a 19.2 Msun O star companion. This system appears to be the clearest example of a potential progenitor of a BH-NS system. We follow the future evolution of Cyg X-1, and show that it will soon encounter a Roche lobe overflow episode, followed shortly by a Type Ib/c supernova and the formation of a NS. It is demonstrated that in majority of cases (70%) the supernova and associated natal kick disrupts the binary due to the fact that the orbit expanded significantly in the Roche lobe overflow episode. In the remainder of cases (30%) the newly formed BH-NS system is too wide to coalesce in the Hubble time. Only sporadically (1%) a Cyg X-1 like binary may form a coalescing BH-NS system given a favorable direction and magnitude of the natal kick. If Cyg X-1 like channel (comparable mass BH-O star bright X-ray binary) is the only or dominant way to form BH-NS binaries in the Galaxy we can estimate the empirical BH-NS merger rate in the Galaxy at the level of 0.001 per Myr. This rate is so low that the detection of BH-NS systems in gravitational radiation is highly unlikely, generating Advanced LIGO/VIRGO detection rates at the level of only 1 per century. If BH-NS inspirals are in fact detected, it will indicate that the formation of these systems proceeds via some alternative and yet unobserved channels.

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