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RECENT SURVEY ON BLACK HOLE-NEUTRON STAR MERGERS

Abstract

A black hole neutron star (BHNS) merger occurs when a black hole and a neutron star come close enough to merge during the Hubble time. BHNS mergers, unlike binary mergers (BBHs and BNSs), are harder to detect. The first BHNS merger was detected in 2020 by gravitational wave detectors, the Laser Interferometer Gravitational-Wave Observatory (LIGO), and Virgo. BHNS systems typically form in an isolated binary system and can merge either by tidal disruption or by the black hole swallowing the neutron star. Studying BHNS mergers is crucial in understanding various physical processes, including the equation of the state of the neutron star and stellar formation. Observations of these systems will allow us to compare them with the theoretical models giving us a better understanding of gravitational waves and testing general relativity more scrupulously. In this paper, we demonstrate the formation process of BHNS systems and their merger dynamics. Moreover, we present a survey of all BHNS mergers detected by the LIGO and Virgo detectors until the end of the third observation run (O3). We also identify the observation candidates for BHNS merger events in the fourth observation run (O4). Finally, we show the new detection sensitivities for the upgraded LIGO detector scheduled to operate in May 2023. This will help us understand the new limits of observing more BHNS mergers in the future.