

Gravitational Waves from Mergers of Asymmetric Dark Stars

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A strongly self-interacting component of asymmetric dark matter (DM) particles can form compact dark stars (DSs). These objects have a broad spectrum of masses and radii, with distinct evolution histories from both neutron stars and black holes (BHs). These differences allow a population of DSs to contribute significantly to the astrophysical merger rate in unique and discernible ways. Specifically, their merger rate could dominate at low redshifts over other sources, while their mass function may populate windows outside known astrophysical processes. In this presentation, I will summarize the structure and formation of DSs within a dissipative model, and show the enhancement of their merger cross-section due to tidal deformation effects. From this, I derive the cosmological DS merger rate and discuss the DM parameter space available for observation. These findings open a new window to probe DM substructure and particle interactions through present and future gravitational wave (GW) observatories.

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