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Determining Dark Matter Properties from Gravitational Wave Observations of Dark Matter Induced Implosions of Neutron Stars and Their Tidal Deformability. DIVYA SINGH, Pennsylvania State University, ANURADHA GUPTA, University of Mississippi, B. SATHYAPRAKASH, Pennsylvania State University, SANJAY REDDY, University of Washington — In this work, we explore the capability of future gravitational-wave detectors like the proposed US Cosmic Explorer and the European Einstein Telescope to distinguish between populations of sub-solar mass black-holes formed through dark-matter induced implosions of neutron stars and neutron stars using tidal deformability measurements. If progenitor binaries survive long enough such that dark matter particles, with some interaction cross-section and mass, get accumulated in the core of neutron stars to form a significant mass that can accrete more particles, such neutron stars are expected to collapse and form black-holes in the mass range 1-3 solar masses. In this scenario, we expect to see three kinds of compact binary populations in this mass range - binary neutron stars, binary black-holes, or neutron star - black hole binary systems. We study the tidal deformability distributions and relative rates of these populations to constrain the properties of dark matter particles.

Divya Singh
Pennsylvania State University

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