DNP10-2010-000205

Abstract for an Invited Paper
for the DNP10 Meeting of
the American Physical Society

Gravitational Wave Astronomy: Exploring the astrophysics of compact object mergers

LEE SAMUEL FINN, Penn State

When they reach design sensitivity the next generation of ground-based gravitational wave detectors are expected to observe better than one compact object merger per month (and perhaps as many as one per day) throughout a $\sim 10^7\,\mathrm{Mpc}^3$ volume of space. The majority of these anticipated mergers will be binary neutron star coalescences. The gravitational waves radiated by a source provide a unique perspective on the source's mass-energy dynamics: the changing disposition of mass-energy and the evolving momentum currents. When coupled with simultaneous gamma-ray, x-ray, optical and neutrino observations, gravitational wave observations of compact object mergers offer an unequaled opportunity to explore how nuclear, neutrino, transport and hydrodynamic processes shape extreme astrophysical phenomena, In this presentation we will explore the anticipated capabilities of the next-generation ground-based gravitational wave detectors (LIGO, Virgo and the LCGT), the compact object merger astrophysics that will drive the observed gravitational waves, and how those observations, alone or in concert with electromagnetic and/or neutrino observations, can be used to inform our understanding of the phenomena that underlies them.