APR12-2012-000765

Abstract for an Invited Paper
for the APR12 Meeting of
the American Physical Society

Decoding Gravitational Waves from Compact Binary Coalescence Events

WILL FARR, Northwestern University

It is an exciting time for gravitational wave astrophysics! The LIGO and Virgo gravitational wave detectors are currently undergoing an upgrade that will improve their sensitivity by a factor of about 10. At this "advanced" sensitivity, it is likely that they will detect at least one gravitational wave signal from a coalescing compact binary per year; it is possible that detection rates may be several hundred times that. In this talk, I will discuss the techniques we have developed in the LIGO and Virgo Collaborations for extracting the astrophysical parameters of the sources that produce these gravitational waves and for performing model selection (i.e. between spinning and non-spinning models) on the signal. I will focus on the ways we overcome the dual challenges of high dimensionality—at least nine parameters for a circular, non-spinning binary black hole system, fifteen for a dual-spin binary black hole, and more if neutron star matter is involved—and a highly non-linear parameter space with significant correlations between parameters. Finally, I will discuss some of the tests we have performed that demonstrate the potential of our algorithms and give us confidence in the recovered parameter distributions and model probabilities, including a complete, end-to-end test of the interferometer system through a blind injection into the LIGO and Virgo detectors in September 2010.