Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Estimating the parameters of non-spinning binary black holes using ground-based gravitational-wave (GW) detectors: Statistical errors[1]

SUKANTA BOSE, Washington State University, P. AJITH, California Institute of Technology — We assess the statistical errors in estimating the parameters of non-spinning black-hole binaries using ground-based GW detectors and discuss their cosmological implications. While past assessments were based on partial information provided by only the inspiral and / or ring-down pieces of the coalescence signal, our projections use "complete" inspiral-merger-ringdown waveforms, and employ the Fisher-matrix formalism, vetted by Monte-Carlo simulations. Parameter accuracies of the complete waveform are found to be significantly better than those of just the inspiral waveform. In the Advanced LIGO detector, parameter estimation is the most accurate in the total-mass range $M \approx 100 - 200 M_\odot$. For $M \approx 100 M_\odot$ systems, the errors in measuring M and the mass-ratio are reduced by an order of magnitude or more compared to waveforms of the inspiral phase alone. Moreover, for $M \approx 100 M_\odot$ systems at distances of 1 Gpc, we estimate that an Advanced LIGO-Virgo type network is capable of determining the sky-position with an accuracy of from about 0.01 square-degree to a square-degree, with a mean of nearly 0.1 square-degree. The sky-averaged fractional error in its distance is about 20%.

[1]Supported in part by the NSF grants PHY-0239735 and PHY-0758172.

Sukanta Bose
Washington State University

Date submitted: 09 Jan 2009

Electronic form version 1.4