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Detection and Measurement of Heavy Black Hole Binaries PHILIP GRAFF, University of Maryland - College Park, ALESSANDRA BUONANNO, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), B. SATHYAPRAKASH, Cardiff University — The advanced LIGO and Virgo detectors will provide sensitivity to gravitational waves down to frequencies of 10 Hz. The merger frequency of binary black hole (BBH) systems scales inversely with the total mass, meaning that this sensitivity improvement will allow for detection and measurement of more massive binaries. In this study, we used inspiral-merger-ringdown (IMR) waveform models based on the effective-one-body (EOB) formalism that also incorporate higher-order modes of radiation beyond the leading $(2, 2)$ mode. We perform Bayesian analysis of massive BBH systems with total masses from $50M_{\odot}$ to $500M_{\odot}$. We investigate the dependence on total mass of the measurement of the masses of the system and demonstrate the importance of the sub-dominant modes both in detection and measurement. The predominant direction of the degeneracy in mass space changes as the signal power is increasingly dominated by the merger and ringdown portions of the waveform for larger total masses. Including these phases as well as higher-order modes is important for ensuring more complete detection and accurate parameter estimation from massive BBH signals.

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