Searching for Gravitational Waves from the Coalescence of High Mass Black Hole Binaries SOPHIA XIAO, Univ of Virginia, LIGO Scientific Collaboration, LIGO SCIENTIFIC COLLABORATION — We search for gravitational waves from the coalescence (inspiral, merger and ringdown) of binary black holes with data from the Laser Interferometer Gravitational-Wave Observatory (LIGO). Provided with well-described waveform models from General Relativity, matched filtering is employed in the GSTLAL analysis pipeline as the optimal detection technique for weak signals in Gaussian noise. The GSTLAL analysis pipeline filters data with waveform template banks, identifies triggers with SNR greater than 4, forms coincident triggers between multiple detectors in the LIGO Scientific Collaboration, and attempts to optimally separate signal from detector background noise fluctuations using a Chi-squared test. We run high-statistics simulations of binary merger waveforms injected into LIGO recolored S6 data to evaluate the pipeline search sensitivity, to test the readiness of the pipeline for Advanced LIGO. With Advanced LIGO fully in operation by 2015 and the upgraded analysis pipelines, the expected detection rate is increased to as much as 100 events/year or more as compared to 0.01-1 events/year in Initial LIGO. Our work will make it possible to detect gravitational waves from binary black hole coalescence in Advanced LIGO data with high confidence.

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