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Impact of calibration uncertainties on cosmological measurements from gravitational wave sources

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Calibration is a key step in gravitational wave (GW) analysis converting the photodetector output in the ground-based interferometers to the strain data from which we extract GW signals. In this talk, we present an ongoing study on how calibration errors and uncertainties can affect astrophysical parameter estimation and cosmological measurements. We simulate different types of compact binary coalesces, and add artificial calibration errors motivated by real detector behaviors. We focus on the results on luminosity distance since it is the most important parameter for constraining the Hubble constant. At the single event level, the systematic errors on luminosity distance are smaller than statistical uncertainties, with relative uncertainties of 3% for events with a signal-to-noise ratio of 50. However, the bias may become more significant when we combine multiple events. Thus, we will also simulate a population of 100 binary neutron stars and perform hierarchical Bayesian inference to understand potential biases on the Hubble constant measurement due to calibration errors and uncertainties.

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