

Gravitational Wave Cosmology: From Standard to Biased Sirens

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The measurement of the Hubble constant has become a critical effort given the discrepancy between the early and late universe measurements, dubbed as the Hubble tension. Since the discovery of gravitational waves (GWs) in 2015, compact binary mergers are used as an independent probe to infer cosmological parameters, since they may allow for joint measurements of their luminosity distance and redshift. The most common assumption at the very first step of this process is that the binary merger evolves in vacuum. However, it is widely accepted that a significant fraction of mergers originate in Active Galactic Nucleus (AGN) disks, meaning that there will be a gaseous environment and third body contribution to the binary evolution. We show that neglecting these so-called environmental effects in the waveform, leads to biased cosmological inference, severely limiting the prospects for alleviating the Hubble tension with GWs.

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