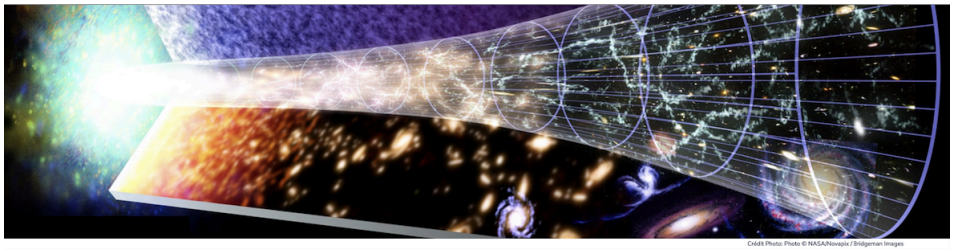

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Towards Unbiased Hubble Constant Measurements Using Gravitational-Wave Standard Sirens

mardi 15 avril 2025 11:25 (25 minutes)

Gravitational waves enable independent measurements of the Hubble constant through luminosity distance estimates combined with external redshift data. Current measurements are dominated by the single "bright siren"GW170817. As soon as new data points become available (which may already be the case during the ongoing observing run of the LIGO-Virgo-KAGRA collaboration), systematic biases—particularly electromagnetic (EM) selection effects—could significantly impact these measurements, especially when relying on short gamma-ray bursts (GRBs) as counterparts. Since GRBs are only observed for binaries whose orbital angular momentum is aligned with our line of sight, this introduces a bias in the distance estimate due to the correlation between distance and inclination.

I will discuss a novel approach to removing this bias by determining the electromagnetic detection probability directly from the observed sample of GW-GRB events, without requiring additional external information. I will argue that ignoring this bias could shift the inferred value of the Hubble constant by about 10% with just two events and become statistically significant with more detections, highlighting the importance of incorporating this correction in ongoing and future gravitational-wave observations.

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