

H_0 Inference with Gravitational Wave Standard Sirens: A Mock Data Challenge

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The detection of GW170817 enables us to determine the Hubble constant H_0 using the standard siren method [1] and opens an era of gravitational-wave cosmology. When an unambiguous identification of the host galaxy is not possible or an electromagnetic counterpart is unexpected such as from a binary black hole merger, a statistical method [2] can be applied to infer the Hubble constant value by cross-correlating the gravitational wave location and the distribution of a galaxy catalog. By combining inferences from multiple gravitational wave events using Bayesian statistics, we expect to determine Hubble constant to higher precision. In our research, we perform a mock data challenge of mimicking a local universe and detections of about 250 gravitational wave signals in it to measure the Hubble constant statistically. We address various systematic effects such as those from the incompleteness of a galaxy catalog on the measurement accuracy and precision of the Hubble constant.

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- [1] The LIGO Scientific Collaboration and The Virgo Collaboration, The 1M2H Collaboration, The Dark Energy Camera GW-EM Collaboration and The DES Collaboration, The DLT40 Collaboration, The Las Cumbres Observatory Collaboration, The VINROUGE Collaboration, and The MASTER Collaboration, A gravitational-wave standard siren measurement of the Hubble constant, *Nature* **551**, 85 (2017).
- [2] B. F. Schutz, Determining the Hubble constant from gravitational wave observations, *Nature* **323**, 310 (1986).