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Type: Talk

Constraints on the Hubble parameter H_0 with gravitational-waves events from the third observing run of LVK

Tuesday 6 September 2022 09:00 (30 minutes)

The LIGO-Virgo-Kagra (LVK) collaboration uses a subset of 47 gravitational-wave (GW) events from the third observing run to constrain the cosmology and in particular the Hubble constant H_0 . The Hubble constant can be constrained using the luminosity distance inferred from each GW signals of compact binary coalescence, combined with an estimation of their corresponding redshift. Two approaches are employed: the first one investigates the mass-redshift degeneracy and the second one makes use of an external galaxy catalog. The first method uses the mass-redshift degeneracy of the binary black-hole (BBH). By breaking this degeneracy, the cosmological parameters are inferred jointly along with the population of BBH systems. When combined with the binary neutron star event GW170817, the Hubble constant is estimated at $H_0 = 68_{-8}^{+12} \text{ km.s}^{-1}.\text{Mpc}^{-1}$ (68%CI). On the other hand, the galaxy catalog method statistically associates each BBHs source to its potential host galaxy, then infers the redshift from these galaxies' information. Under the assumption of a fixed population model of BBHs, the Hubble parameter is estimated at $H_0 = 68_{-6}^{+8} \text{ km.s}^{-1}.\text{Mpc}^{-1}$, which represents a 42% improvement in uncertainty compared to the value inferred from the first observing run of LVK. In the future, GW detections may play a significant role for cosmology, bringing a discriminating measurement of H_0 in the context of the Hubble tension.

Is this abstract from experiment?

Yes

Name of experiment and experimental site

LIGO-Virgo Interferometers (Hanford, Livingston and Cascina)

Is the speaker for that presentation defined?

Yes

Details

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Internet talk

No

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