Editorial

The hot big bang model is an amazing idea to explain the origin and the evolution of our universe. The Hubble constant (H_0) characterizing the current expansion rate of the universe is one of the key parameters in the hot big bang model. A lot of efforts have been made to measure its value, and now an around 1% measurement accuracy is already available. For example, recently a direct measurement made by Riess et al. [1] indicates $H_0=(74.03\pm1.42)$ km s⁻¹ Mpc⁻¹ at 68% confidence level. On the other hand, the six-parameter Λ CDM model can consistently explain almost all of the observational data, and is taken as a concordance cosmological model. In this model, the cosmological constant Lambda plays the role of the dark energy which accelerates the current expansion of the universe, the dark matter is a cold one, while baryonic matter only occupies around 5% energy density in the universe. Based on such a concordance model, the data released by the full-mission Planck satellite measurements of the Cosmic Microwave Background (CMB) anisotropies implies $H_0=(67.27\pm0.60)$ km s⁻¹ Mpc⁻¹ at 68% confidence level [2], which has a tension with the direct measurement given by Riess et al. at the 4.4σ level. Thus, it is quite important to find some new independent measurements to justify these two results. Recently the combination of the low-redshift observational data from the Pantheon sample of Type Ia Supernovae, the baryonic acoustic oscillation (BAO) and the tomographic Alcock-Paczynski method to the BOSS DR 12 galaxies gives $H_0=67.95^{+0.78}_{-1.03}$ km s⁻¹ Mpc⁻¹ [3] which is nicely consistent compared with the measurement from CMB data, but still has a 3.75σ tension with that given by Riess et al.

Recently, there have been a lot of studies to harmonize the tension. If the Hubble tension is significantly confirmed in the future, it definitely implies new physics beyond the concordance cosmological model. This would be a new milestone in the way to understand our universe. In this special topic, it has been shown that such a tension might be significantly relieved by a gigaparsec-scale local void produced by multi-stream inflation where different parts of observable universe follow different inflationary trajectories [4], by including the massive sterile neutrinos in the interacting holographic dark energy model [5], or a perturbation to the recombination processes by some exotic variations of atomic constants [6]. In addition, such a tension may also shift the value of the spectral index of scalar perturbation, thus leading to the supersymmetric inflation model favorable [7].

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