ID de la contribución : **26** Tipo : **Oral presentation**

Role of large-scale structures in cosmological evolution with multi-messenger signatures

martes, 15 de septiembre de 2026 17:00 (25)

Recent observations have revealed the presence of cosmic structures at even very large scales in the Universe. This, along with cosmological tensions, motivates re-examination of the standard paradigm of the concordance model based on assumptions of homogeneous matter distribution at various cosmological scales. The observed large-scale matter inhomogeneities may possibly impact the background Hubble evolution through their backreaction on the cosmological metric. We compute the effects of backreaction through the Buchert formalism for averaging on spatial hypersurfaces, employing various physically motivated ansatzes for multiple-domain cosmic inhomogeneities. The resulting altered Hubble evolution, when confronted with data from various recent observations, leads to tight constraints on the backreaction models. Remarkably, our analysis predicts interesting signatures on various kinds of astronomical signals, such as the, (a) red-shift drift, (b) 21-cm brightness temperature, and (c) amplitude of gravitational waves from compact binaries. Moreover, we show how the Hubble tension gets alleviated through the obtained best-fit parameters of our backreaction models.

References:
[1] Effect of inhomogeneities on the propagation of gravitational waves from binaries of compact objects, S. S. Pandey, A. Sarkar, A. Ali, A. S. Majumdar, JCAP 06, 021 (2022).
[2] Global 21-cm brightness temperature in viscous dark energy models, A. Halder, S. S. Pandey, A. S. Majumdar, JCAP 10, 049 (2022).
[3] Viscous attenuation of gravitational waves propagating through an inhomogeneous background, S. S. Pandey, A. Sarkar, A. Ali, A. S. Majumdar, Eur. Phys. J. C 83, 435 (2023).
[4] Future deceleration due to backreaction in a Universe with multiple inhomogeneous domains, A. Halder, S. S. Pandey, A. S. Majumdar, JCAP 08, 064 (2023).
[5] Analyzing the 21-cm signal brightness temperature in the Universe with inhomogeneities, S. S. Pandey, A. Halder, A. S. Majumdar, Phys. Rev. D 110, 043531 (2024).
[6] Constraining the Hubble parameter with the 21-cm brightness temperature signal in a universe with inhomogeneities, S. Mukherjee, S. S. Pandey, A. S. Majumdar, Phys. Rev. D 112, 063520 (2025).
[7] Optical depth to reionization in a Universe with multiple inhomogeneous domains, S. S. Pandey, Ruchika, S. Mukherjee, A. S. Majumdar, arXiv: 2604.13718 [astro-ph.CO].

Primary author(s) : Prof. MAJUMDAR, Archan S (S. N. Bose National Centre for Basic Sciences)

Presenter(s) : Prof. MAJUMDAR, Archan S (S. N. Bose National Centre for Basic Sciences)

Clasificación de la sesión : Afternoon Session (Tuesday)