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(I) Deciphering the Baryonic Universe: A New Window Into the Cosmos

Thursday, 9 June 2022 08:45 (30 minutes)

The history of baryonic material, particularly after the epoch of 'Cosmic Dawn'– the onset of the earliest stars and galaxies – is widely considered the 'final frontier'of cosmological surveys today. The technique of intensity mapping (IM) has emerged as the powerful tool to explore this phase of the Universe by measuring the integrated emission from sources over a broad range of frequencies. A particular advantage of IM is that it provides a tomographic, or three-dimensional picture of the Universe, unlocking several thousand times more independent modes of information than one can obtain from conventional probes. I will illustrate how the description of dark matter haloes can be extended in a novel, data-driven framework to describe baryonic abundances and clustering over 12 billion years of cosmic time. Extensions of this model pave the way towards a comprehensive understanding of molecular gas evolution, by using the carbon monoxide (CO), ionized carbon and oxygen ([CII] and [OIII]), as tracers of large-scale structure. This innovative approach allows us to fully utilize the latest data to constrain cosmological parameters from future observations. I will present a host of fascinating implications for constraining physics beyond the LCDM model, including tests of the theories of inflation, the nature of dark matter and dark energy.

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