2025 CAU-IBS Beyond the Standard Model Workshop



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Reconciling cosmological tensions with inelastic dark matter and dark radiation

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In this talk I will introduce a novel particle physics framework addressing multiple cosmological tensions, including discrepancies in the Hubble parameter, S8, and Lyman-\alpha forest data. This model, SIDR+z_t (Self-Interacting Dark Radiation with transition redshift), features an inelastic dark matter (IDM) scenario coupled with dark radiation under a dark gauge symmetry. The model incorporates cold dark matter, strongly interacting dark radiation, and their interactions, suppressing free-streaming effects and attenuating the matter power spectrum at small scales. The inelastic nature of dark matter introduces a distinct temperature-dependent interaction rate, crucial for resolving Lyman-\alpha discrepancies. Solving the relevant Boltzmann equations, we explore the model's consistency with Big Bang Nucleosynthesis and its ability to produce additional contributions prior to recombination while achieving the correct dark matter relic density.

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Session Classification: Inflation & GW