



Contribution ID: 88

Type: Regular plenary talk

A dark matter solution to the H_0 and σ_8 tensions, and the integrated Sachs-Wolfe void anomaly

Thursday, February 20, 2025 9:35 AM (10 minutes)

The significant tensions in constraints on the Hubble constant (H_0) and clustering amplitude (σ_8) between early- and late-universe observations challenge key assumptions of the Λ CDM cosmological model. One of these assumptions is the presence of cold dark matter, a yet-to-be-detected non-relativistic particle with minimal interaction with the Standard Model that dominates the mass budget of the universe.

We propose a phenomenological model where dark matter's pressure-to-energy ratio, or equation of state, w , evolves over time, enabling it to influence both the universe's expansion rate H_0 and structure formation σ_8 . The model reduces the H_0 tension from $\sim 5\%$ to $\sim 3\%$ and the σ_8 tension from $\sim 3\%$ to $\sim 1\%$.

Moreover, this model explains the anomalously large Integrated Sachs-Wolfe (ISW) effect observed in cosmic voids, a key puzzle in large-scale structure analyses. Observations suggest an unexpectedly strong ISW signal from voids, which our model enhances by a factor of ~ 2 . This provides a testable prediction and supports the idea that dark matter properties influence both small- and large-scale cosmology.

These results extend to unified or interacting dark matter-energy models, with void ISW signals offering a promising avenue for resolving cosmological tensions.

Primary authors: Dr NAIDOO, Krishna (University of Portsmouth); JABER, Mariana (CFT Polish Academy of Sciences)

Co-authors: BILICKI, Maciej (Center for Theoretical Physics PAS); HELLWING, Wojciech (Center for Theoretical Physics PAS)

Presenter: JABER, Mariana (CFT Polish Academy of Sciences)

Session Classification: Cosmology & Fundamental Physics

Track Classification: Cosmology & Fundamental Physics