

Addressing the DESI DR2 Phantom-Crossing Anomaly and Enhanced H_0 Tension with Reconstructed Scalar-Tensor Gravity

miércoles, 16 de septiembre de 2026 14:50 (25)

Recent cosmological data, including DESI DR2, highlight significant tensions within the Λ CDM paradigm. When analyzed in the context of General Relativity (GR), the latest DESI data favor a dynamical dark energy (DDE) equation of state, $w(z)$, that crosses the phantom divide line $w = -1$. However, this framework prefers a lower Hubble constant, H_0 , than Planck 2018, thereby worsening the tension with local measurements. This phantom crossing is a key feature that cannot be achieved by minimally coupled scalar fields (quintessence) within GR. This suggests the need for a new degree of freedom that can simultaneously: (A) increase the best-fit value of H_0 in the context of the DESI DR2 data, and (B) allow the crossing of the $w = -1$ line within a new theoretical approach. In this talk I will demonstrate that both of these goals may be achieved in the context of Modified Gravity (MG), and in particular, Scalar-Tensor (ST) theories, where phantom crossing is a natural and viable feature.

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Clasificación de la sesión : Afternoon Session (Wednesday)