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Plenary — Shinji Tsujikawa: Dark Energy with Stable Phantom-Divide Crossing: Model Construction and Observational Constraints

Monday, 16 November 2026 09:30 (1 hour)

Recent cosmological observations have revived interest in dark energy whose equation of state evolves from below -1 to above -1 at low redshift. In this talk, I will discuss how to construct theoretically consistent models realizing this transition and test them against observations. I will first explain the obstacles to achieving such a crossing in shift-symmetric Horndeski and generalized Proca theories with luminal gravitational-wave propagation and no direct dark-matter couplings. I will then present two ways to overcome these obstacles: introducing a scalar potential that breaks shift symmetry in a Horndeski model, and combining a generalized Proca vector field with a canonical scalar field. Particular attention will be paid to the conditions ensuring the absence of ghost and gradient instabilities, as well as the implications for matter clustering and gravitational lensing. I will also present constraints on a scalar-vector-tensor dark-energy model using the DES five-year supernova sample, second-release DESI baryon acoustic oscillation measurements, compressed cosmic microwave background constraints, and growth data from redshift-space distortions. The results allow stable crossing histories and improve the best-fit likelihood relative to flat Λ CDM. I will discuss Bayesian model comparison, including its sensitivity to theoretical viability conditions and prior normalization, and the prospects for distinguishing these models through cosmic expansion and structure growth.