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Dark Energy and Neutrino Mass –Measurements from DESI DR2 using BAO

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The DESI collaboration (Dark Energy Spectroscopic Instrument) confirmed its groundbreaking results on dynamical dark energy through the largest 3-dimensional Universe map it observed. This talk highlights how DESI Data Release 2 further challenges the Λ CDM paradigm: Baryon Acoustic Oscillation (BAO) measurements reveal a $2\text{--}4\sigma$ preference for dynamical dark energy, particularly when combined with external cosmic microwave background (CMB) data and Supernovae Ia (SNIa) data. Additionally, DESI sets the tightest upper limit on neutrino mass ($\Sigma m_\nu < 0.064\text{eV}$) under Λ CDM, though the posterior distributions intriguingly favour negative values. The dynamical dark energy model relaxes neutrino mass constraints and leaves open the possibility of inverted mass ordering. DESI will release its findings on cosmological parameters and primordial non-Gaussianity with its DR2 in the coming year. These results will further improve our understanding of the dark energy nature, neutrino mass ordering and early-Universe physics.

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