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Novel Test of Dark Energy through High-Redshift Cosmography

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In this work we introduce a high-redshift cosmographic framework based on a new Padé expansion, providing improved accuracy at z
$gtrsim1$. We estimate the cosmographic parameters $H(z)$, $q(z)$, $j(z)$, $s(z)$ at different fixed redhsift values by combining DESI BAO data (calibrated with Planck's sound horizon scale r_d), the Pantheon Plus and DESy5 Type Ia supernova samples, and cosmic-chronometer measurements of $H(z)$. Our analysis yields precise constraints on cosmographic parameters and highlights deviations from the ΛCDM model. We also reconstruct the deceleration parameter $q(z)$, from which we obtain information about the dark-energy equation of state $w(z)$ in a fully model-independent way. These measurements provide a powerful tool to test cosmological models and to investigate the late-time expansion history of the Universe and the nature of dark energy.

Auteurs: FAZZARI, ELISA (Sapienza University of Rome); Dr GIARÈ, William (University of Sheffield); Dr DI VALENTINO, Eleonora (University of Sheffield)

Orateur: FAZZARI, ELISA (Sapienza University of Rome)

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