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The Dark Energy Survey Supernova Program: An updated measurement of the Hubble constant using the Inverse Distance Ladder

by R. Camilleri et al. (including J. Asorey)

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Abstract

We measure the current expansion rate of the Universe, Hubble's constant H0, by calibrating the absolute magnitudes of supernovae to distances measured by Baryon Acoustic Oscillations. This `inverse distance ladder' technique provides an alternative to calibrating supernovae using nearby absolute distance measurements, replacing the calibration with a high-redshift anchor. We use the recent release of 1829 supernovae from the Dark Energy Survey spanning 0.01<z<1.13 anchored to the recent Baryon Acoustic Oscillation measurements from DESI spanning 0.30<zeff<2.33. To trace cosmology to z=0, we use the third-, fourth- and fifth-order cosmographic models, which, by design, are agnostic about the energy content and expansion history of the universe. With the inclusion of the higher-redshift DESI-BAO data, the third-order model is a poor fit to both data sets, with the fourth-order model being preferred by the Akaike Information Criterion. Using the fourth-order cosmographic model, we find H0=67.19+0.66−0.64 km s−1 Mpc−1, in agreement with the value found by Planck without the need to assume Flat-ΛCDM. However the best-fitting expansion history differs from that of Planck, providing continued motivation to investigate these tensions.

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