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Anchoring Redshift Evolution with a Spectroscopically-Normal Type Ia Supernova at z = 2

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The Nancy Grace Roman Space Telescope will provide a revolutionary measurement of evolving dark energy out to z < 3. The accuracy of this measurement is predicated on the assumption that Type Ia supernova (SN Ia) luminosities do not evolve with redshift. If present, SN Ia luminosity evolution is expected to be most detectable in the dark matter–dominated era of the Universe (z > 1.5); its effects becoming more pronounced with increasing redshift. Into the Roman era, JWST will remain the only observatory capable of classifying and characterizing z > 2 SNe via spectroscopy. We present the discovery and classification of SN 2025ogs, a normal-SNe Ia at z = 2.049 +/- 0.007. As an anchor in the dark matter-dominated era, this SN offers a key point of comparison for interpreting future high-redshift SN Ia samples. The multi-band NIRCam light curve indicates a blue color (B - V = −0.28 +/- 0.06 mag) and moderately fast-decline (Δm15(B) = 1.55 +/- 0.15 mag), but within standard cosmology cuts. Standardization of its light curve yields a luminosity distance that is in 1.0-σ agreement with ΛCDM. The NIRSpec spectrum (rest-frame optical) displays all of the hallmark absorption features of a normal SN Ia observed at peak-brightness. We find the color, rest-frame near-ultraviolet properties, and Si II line strengths are all consistent with the moderately fast-decline inferred from the multi-band light curve. Multiple absorption features appear less blueshifted relative to SN Ia from the low-z sample. This could indicate that the ejecta of SN 2025ogs lack the high-velocity components typically observed in low-z SN Ia at higher resolution.

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