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High precision nucleon matrix elements based on the unbiased estimate of all-to-all fermion propagators

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We report a high-precision calculation of the nucleon isospin vector charge $\langle g_{\{S,T\}} \rangle$ using the recently proposed “blending” method, which provides high-precision stochastic estimates of the all-to-all fermion propagator. A interpolator basis element that explicitly includes the current is employed to suppress a specific nucleon–meson type of excited-state contamination, whose couples to the current operator and is enhanced by the lattice spatial volume. Based on calculations at five lattice spacings, each with multiple volumes at fixed pion mass (including the physical pion mass), we demonstrate that both the blending method and the current-involved basis are efficient and essential for suppressing excited-state contamination and for revealing hidden systematic uncertainties.

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