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Accurate nucleon iso-vector scalar and tensor charge from tadpole improved clover ensembles

We report a new high precision calculation of the isospin vector charge $g_{S,T}$ of the nucleon using recently proposed "blending" method which provides a high-accuracy stochastic estimate of the all-to-all fermion propagator. By combining the current-inspired interpolation field, which can efficiently cancel the major excited state contamination, we found that both g_S and g_T have significant finite volume effects which are not suppressed in the chiral limit. Using 15 of the $N_f = 2 + 1$ lattice ensembles which covers 5 lattice spacing, 5 combinations with the same quark masses and lattice spacing but multiple volumes, and includes three at the physical pion mass, we report so far most accurate lattice QCD prediction $g_T^{\rm QCD} = 1.0253[94]_{\rm tot}(55)_{\rm stat}(46)_a(59)_{\rm FV}(13)_\chi(06)_{\rm ex}$ and $g_S^{\rm QCD} = 1.103[44]_{\rm tot}(32)_{\rm stat}(04)_a(26)_{\rm FV}(01)_\chi(15)_{\rm ex}$ at $\overline{\rm MS}$ 2~GeV, with the systematic uncertainty from infinite volume, continuum, and chiral extrapolations.

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