

Lattice 2024



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## Electroweak correction to parity violating ep scattering

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We present a first-principle lattice QCD calculation of the axial  $\gamma Z$  box correction, which is necessary to be taken into account to determine the weak charge in low energy parity violating ep scattering. We calculate the electron energy dependence of axial  $\gamma Z$  box up to 155MeV, which perfectly matches the beam energy range of the upcoming PVES experiment at Mainz  $E < 155\text{MeV}$ . Combining the axial  $\gamma Z$  correction given by this work and latest vector  $\gamma Z$  contribution calculated by phenomenological method, we update the value of full  $\gamma Z$  box correction at  $E = 155\text{MeV}$ , illustrating that the vector contribution now dominates the uncertainty of total  $\gamma Z$  box correction. We also update SM prediction of weak charge using our result at  $E = 0\text{MeV}$ , and our preliminary result shows that it probably shows a small deviation from the original value in 2022 PDG.

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