

Probing the Zbb anomalous couplings

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To resolve the long-standing discrepancy between the precision measurement of bottom quark forward-backward asymmetry at LEP/SLC and the Standard Model prediction,

we propose four different novel methods to probe the Zbb couplings by measuring $gg \rightarrow Zh$ production, Z boson exclusive decay at the LHC and (average jet charge weighted) single-spin asymmetry at the HERA and EIC. We demonstrate that $gg \rightarrow Zh$ cross section, the branching ratio of $Z \rightarrow \Upsilon(ns) + \gamma$,

and jet charge weighted single-spin asymmetry are sensitive to the axial-vector component of the Zbb coupling, while the single-spin asymmetry is sensitive to the vector component. The apparent degeneracy of the Zbb couplings implied by the LEP precision electroweak measurements could be resolved by the current 13 TeV LHC Zh data.

We also show the potential to verify or exclude the LEP data and resolve the AFB puzzle through those methods.

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