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Precision tests of the Standard Model in global SMEFT analyses: Fitting with a CLEW

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Semileptonic charged-current (CC) interactions are crucial for exploring the nuances of the Standard Model (SM) and its possible extensions. Recent examinations have underscored discrepancies with the SM predictions, particularly in the Cabibbo Angle Anomaly (CAA), which demonstrates a 3σ deviation from zero. In this paper, we undertake a rigorous analysis using the SMEFT framework to shed light on potential BSM sources of the CAA. By integrating insights from collider processes ("C"), low-energy CC processes ("L"), and electroweak precision observables ("EW"), we introduce a holistic "CLEW" approach. Our analysis underscores the significance of a global CLEW perspective in vetting BSM propositions that align with observations across scales, from the weak to the TeV range. While our initial impetus revolves around the CAA, our findings naturally establish a foundational CLEW framework, poised to significantly influence future SMEFT investigations, especially those sidelining severe phenomenological constraints, including FCNCs and CP violations. We will touch upon preliminary results within the ambit of the $U(3)^5$ flavor assumption, followed by an in-depth exploration of a "flavor-assumption-independent" analysis. In this broader analysis, we have incorporated the Akaike Information Criterion (AIC). When combined with the χ^2 method, the AIC promotes a model that not only aligns well with experimental data but also circumvents unnecessary complexities, accentuating the challenges and prospective avenues for model-independent global analyses.

Summary

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