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Testing naturalness through precision measurements

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Symmetry-based solutions of the hierarchy problem generically predict new states that cancel the Standard Model one-loop quadratic divergence of the Higgs mass. Phenomenological investigations are generally focused on the top-partners, expected to be at the TeV scale by naturalness arguments, their quantum numbers are model-dependent. While direct LHC searches have so far turned empty-handed regarding the presence of such new particles, loop-induced observables provide complementary probes and may prove essential to fully characterize their properties.

In this work, we evaluate the contributions of a selection of top-partners representations to quantities such as the Peskin-Teukachi parameters and the loop-induced Higgs couplings. In particular, we investigate whether such observables can provide a test of the required relation between the top Yukawa and top-partner couplings needed to insure the loop cancellation.

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