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# Higgs Gravitational Interaction, Weak Boson Scattering, and Higgs Inflation in Jordan and Einstein Frames

We study gravitational interaction of Higgs boson through the unique dimension-4 operator ξHˆ{\dag}HR , with H the Higgs doublet and R the Ricci scalar curvature. We analyze the effect of this dimensionless nonminimal coupling ξ on weak gauge boson scattering in both Jordan and Einstein frames. We demonstrate that the weak boson scattering amplitudes computed in both frames are equal in flat background. We explicitly establish the longitudinal-Goldstone equivalence theorem with nonzero ξ coupling in both frames, and analyze the unitarity constraints. We study the ξ-induced weak boson scattering cross sections at O(1–30)TeV scales, and propose to probe the Higgs-gravity coupling via weak boson scattering experiments at the LHC (14 TeV) and the next generation pp colliders (50 – 100 TeV). We further extend our study to Higgs inflation, and quantitatively derive the perturbative unitarity bounds via coupled channel analysis, under large field background at the inflation scale. We analyze the unitarity constraints on the parameter space in both the conventional Higgs inflation and the improved models in light of the recent BICEP2 data.

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