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Status of negative coupling modifiers for extended Higgs sectors

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In this work, we study the status of negative coupling modifiers in extended Higgs sectors, focusing on the ratio of coupling modifiers that probes custodial symmetry violation $\lambda_{WZ} = \kappa_W/\kappa_Z$. Higgs sectors with multiplets larger than doublets are the only weakly coupled models that give tree-level modifications to λ_{WZ} , and we explore all such models allowed by the constraint from the ρ parameter and perturbative unitarity. This class of models has a custodial symmetry violating potential, while the vacuum configuration preserves the symmetry. We apply precision measurements from ATLAS and CMS and show that each data set can exclude a vast set of models with $\lambda_{WZ} < 0$ at greater than 95% confidence level. We give evidence that $\lambda_{WZ} < 0$ is excluded in all weakly coupled models.

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