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Higgs Flavor and Multi-Higgs Production

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While precision measurements of the Higgs at the LHC continue to confirm its Standard Model-like nature, many of its properties, in particular its couplings to light quarks and to itself, remain essentially unconstrained. Di-Higgs production is well known to be a direct probe of the self coupling, but as I will argue, it is also a powerful probe of Higgs flavor. In models where enhanced Yukawas arise from new scalars with large couplings to light quarks, gigantic di-Higgs —and even tri-Higgs —production rates can be obtained, which can be used to constrain or discover these theories. In this talk, I'll motivate such theories and describe how they avoid constraints from flavor while enhancing the Higgs Yukawa couplings to light quarks by orders of magnitude. I will then demonstrate that Multi-Higgs production is the most stringent constraint on the Higgs Yukawas in this context, setting limits on the down Yukawa at roughly 30 times its Standard Model value. I will also show that the currently unexplored triple Higgs production topology could be a potential discovery channel for a variety of extended Higgs sectors at the LHC —including not only models where extra Higgses couple to light quarks, but also popular theories where they couple predominantly to the top quark.

Summary

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