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Simplified Models for Higgs Physics: Singlet Scalar and Vector-like Quark Phenomenology (12' + 3')

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Simplified models provide a useful tool to conduct the search and exploration of physics beyond the Standard Model in a model-independent fashion. In this work we consider the complementarity of indirect searches for new physics in Higgs couplings and distributions with direct searches for new particles, using a simplified model which includes a new singlet scalar resonance and vector-like fermions that can mix with the SM top-quark. We fit this model to the combined ATLAS and CMS 125 GeV Higgs production and coupling measurements and other precision electroweak constraints, and explore in detail the effects of the new matter content upon Higgs production and kinematics. We highlight some novel features and decay modes of the top partner phenomenology, and discuss prospects for Run II.

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