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Common exotic decays of top partners

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Many Standard Model extensions that address the hierarchy problem contain Dirac-fermion partners of the top quark, which are typically expected around the TeV scale. Searches for these vector-like quarks mostly focus on their decay into electroweak gauge bosons or Higgs plus a standard model quark. In this talk, backed by models of composite Higgs, we propose a set of simplified scenarios that include more exotic decay channels, which modify the search strategies and affect the bounds. Analysing several classes of underlying models, we show that exotic decays are the norm and commonly appear with large rates. All of these models contain light new scalars that couple to top partners with charge 5/3, 2/3, and −1/3. We identify the contributing particle content and novel top partner decays that occur most commonly, provide effective Lagrangians, benchmarks, and a brief discussion of phenomenological bounds and newly occurring final states.

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