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The Oddest Little Higgs: Top partners decaying into jets

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The phenomenology of typical charge $2/3$ top partners is determined by their decays $T \rightarrow th$, $T \rightarrow tZ$, $T \rightarrow bW$. Recent CMS and ATLAS searches have bounded the mass of such a top partner to be greater than ~ 700 GeV. We consider a Little Higgs model in which the quadratically divergent top loops are cancelled by a single top partner which is odd under a parity that forbids the couplings responsible for the standard decays. Instead, the top partner decays into third generation fermions and scalars, and the lightest odd scalars decay into light jets via small parity-violating couplings. This scenario has much in common with R-Parity violating SUSY. We find that RPV gluino searches severely constrain the parameter space of such models, but there exists a compressed window which allows for top partners lighter than the typical 700 GeV bound.

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