

Loop Induced Single Top Partner Production and Decay at the LHC

Thursday, July 5, 2018 11:30 AM (15 minutes)

Most searches for top partners, T , are concerned with top partner pair production. However, as these bounds become increasingly stringent, the LHC energy will saturate and single top partner production will become more important. We study the LHC sensitivity to single top partner production in a model where the Standard Model (SM) is extended by an $SU(2)$ singlet top partner and a SM gauge singlet scalar, S . In this model, it is possible that the scalar singlet can mediate loop induced $gg \rightarrow T t$ production, where t is the SM top quark. In fact, we find that the production rate of this channel can be comparable to top partner pair production at top partner masses of $M_T > 1.5$ TeV. In addition, while most current searches focus on the decays $T \rightarrow tZ$, $T \rightarrow th$, $T \rightarrow Wb$ decays, in this model the decay pattern of the top partner can be significantly altered with new decay modes $T \rightarrow gt$, $T \rightarrow \gamma t$, and $T \rightarrow St$. We give an overview of the various production and decay channels of the top partner in this model and classify which modes are dominant in which regions of parameter space. We then project the the sensitivity of the high luminosity LHC to $gg \rightarrow T t$.

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Session Classification: Beyond the Standard Model

Track Classification: Beyond the Standard Model