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Charged Higgs Study in the s-channel Single Top production at LHC

With the current measurements performed by CMS and ATLAS experiments, the light charged Higgs scenario ($m_{H^\pm} < 160$ GeV), is excluded for most of the parameter space in the context of MSSM. However, there is still possibility to look for heavy charged Higgs boson particularly in the s-channel single top production process where the charged Higgs may appear as a heavy resonance state and decay to $t\bar{b}$. The production process under consideration in this paper is $pp \rightarrow H^{\pm} \rightarrow t\bar{b} + h.c.$, where the top quark decays to W^+b and W^+ boson subsequently decays to two light jets. It is shown that despite the presence of large QCD and electroweak background events, the charged Higgs signal can be extracted and observed at a large area of MSSM parameter space ($m_{H^\pm}$,tanβ) at LHC. The observability of charged Higgs is potentially demonstrated with 5σ contours and 95% confidence level exclusion curves at different integrated LHC luminosities assuming a nominal center of mass energy of $\sqrt{s}$ = 14 TeV.

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