

The charged Higgs boson of the two Higgs doublet model type III

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Recently the D0 collaboration reports a direct search for a charged Higgs boson produced by $q\bar{q}$ annihilation and decaying to $t\bar{b}$ final state, in the $180 \leq M_{H^\pm} \leq 300$ GeV mass range, using 0.93 fb^{-1} of data collected at center-of-mass energy $\sqrt{s} = 1.96 \text{ TeV}$. The analysis lead to upper limits on the production cross section in the two Higgs doublet model types I, II and III. We discuss different scenarios for the two Higgs doublet model type III taking into account the previous bounds obtained in the literature on the parameter space of the model. We simulate three different scenarios and we compare them with the data reported by D0 collaboration. Also, searches in the charged Higgs boson mass smaller than top quark mass region have been performed, using the production

cross section of top quark pairs at the Tevatron and we discuss the possible limits on the charged Higgs boson masses obtained from measurements of the ratio $R_\sigma = \sigma_{t\bar{t} \rightarrow t\bar{t}}^{l+jets} / \sigma_{t\bar{t} \rightarrow t\bar{t}}^{dileptons}$ within the framework of the two Higgs doublet model type III.

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