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Charged Higgs boson production via $pp \rightarrow H^\pm b j$ at the LHC

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The charged Higgs searches can be served to probe new physics at the LHC. In this study, we focus on the associated production of the charged Higgs boson with the bottom-quark and jet in 2HDM-type-I as a promising mode for a light H^\pm , i.e. $m_{H^\pm} < m_t$. We consider both situations where $h(H)$ are the SM-like Higgs boson discovered with a mass near 125 GeV and investigate their bosonic decays, such as $H^\pm \rightarrow W^\pm h$ and/or $H^\pm \rightarrow W^\pm A$. We explore the possible signals at the LHC taking into account the theoretical and experimental constraints, as a result, we find that, over a substantial region of the 2HDM-I parameter space, the Signal $qbW + 2b/2\tau/2\gamma$ could serve as a promising and alternative signal that might serve to discover the H^\pm states at the LHC.

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