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## Searching for Charged Higgs Bosons via $e^+e^- \rightarrow H^+H^- \rightarrow c\bar{b}\bar{c}b$ at Linear Colliders

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We study a search for the charged Higgs boson via  $e^+e^- \rightarrow H^+H^- \rightarrow c\bar{b}\bar{c}b$  at the 500 GeV ILC. In a general two Higgs doublet model without  $Z_2$  symmetry, extra Yukawa couplings  $\rho_{tc}$  and  $\rho_{tt}$  can drive electroweak baryogenesis, but searches at the HL-LHC may still go empty-handed if the couplings are relatively weak. Taking  $m_{H^\pm} \simeq m_H \simeq m_A \simeq 200$  GeV, with  $\rho_{tc}, \rho_{tt} \sim 0.1$  and no  $h(125)$ - $H$  mixing,  $H^+ \rightarrow c\bar{b}$  decay is dominant, and the  $c\bar{b}\bar{c}b$  final state is likely overwhelmed by QCD background at the LHC. We show that the electroweak production of  $H^+H^-$  at the ILC can be discovered with integrated luminosity of  $1 \text{ ab}^{-1}$ . Furthermore, we show that  $m_{H^\pm}$  can be extracted by requiring the two pairs of  $b$  and light jets be roughly equal in mass, without assuming the mass value. Thus, ILC can probe low mass Higgs bosons in multijet final states to complement HL-LHC in the future.

### Apply for poster award

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