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Exotic decays of the charged Higgs boson via vectorlike quark loops

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The search strategy of a charged Higgs boson critically depends on its mass relative to the top quark mass. In the frame of two Higgs doublet model, the charged Higgs boson mass determines the main search channel: for the heavy charged Higgs boson, it is into a top quark and a bottom quark; for the light charged Higgs boson, it is into a tau lepton associated with a tau neutrino. The blind spot is where the charged Higgs boson mass is very similar to the top quark mass, which requires alternative decay channel. One clean channel is into a photon associated with a W boson, which should happen only through loops. The SM quarks only lead to very suppressed branching ratio of the order of 10^{-5} . We extend the fermion sector including vectorlike quarks and show that the branching ratio can be as large as 10^{-3} . Another interesting decay mode into a W boson accompanying a Z boson is also studied.

Presenter: SONG, Jeonghyeon

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