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Probing a Z´ with non-universal fermion couplings through top quark fusion, decays to bottom quarks, and machine learning techniques

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We present a new feasibility study on the production of a Z´ boson at the LHC, through top anti-top fusion, with family non-universal couplings, considering proton-proton collisions at 13 TeV and 14 TeV. Such a hypothesis is well motivated theoretically and it can explain observed differences between SM predictions and experimental results, as well as being a useful tool to further probe recent results in searches for new physics considering non-universal fermion couplings. We work under two simplified phenomenological frameworks where the Z´ masses and couplings to the SM particles are free parameters, and consider final states of the Z´ decaying to a pair of b quarks. The analysis is performed using machine learning techniques to maximize the sensitivity. Despite being a well motivated physics case in its own merit, such scenarios have not been fully considered in ongoing searches at the LHC.

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