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Lights on the Dark using EFT approach

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Dark Matter (DM) has become one of the major shortcomings of Standard Model (SM) of Particle Physics. We consider a model independent approach to search for Dark Matter in the context of HL-LHC (High Luminosity Large Hadron Collider) where our DM candidate is a Dirac-like fermion. In this analysis, we present the effect of one dimension-6 and two dimension-7 effective opertors who are responsible for DM-SM interactions. We have constrained our parameter space i.e., the values of the Wilson Coefficients using the recent experimental results from Direct Detection experiments and PLANCK collaboration. We also show that the fermion DM may generate a distinguishable signature at the LHC when pair-produced in association with a SM Higgs which further decays to a pair of b-quarks. We represent a comparative study of signal-background analysis using usual Cut-Based approach and Boosted-Decision Tree (BDT) method. It shows that for Cut-Based analysis, the signal significance varies from 3.8 σ to 0.9 σ for DM-mass range of 90-300 GeV, whereas for BDT, it runs from 6.6 σ to 1.7 σ for same signal and similar mass range of DM.

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