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Anapole Dark Matter via Vector Boson Fusion Processes at the LHC

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Dark matter that is electrically neutral but couples to the electromagnetic current through higherdimensional operators constitutes an interesting class of models. We investigate this class of models at the Large Hadron Collider, focusing on the anapole moment operator in an effective field theory (EFT) framework, and utilizing the vector boson fusion (VBF) topology. Assuming proton-proton collisions at $sqrt(s) = 13$TeV, we present the VBF anapole dark matter (ADM) cross sections and kinematic distributions as functions of the free parameters of the EFT, the cutoff scale and the ADM mass m. We find that the distinctive VBF topology of two forward jets and large dijet pseudorapidity gap is effective at reducing SM backgrounds, leading to a 5 σ discovery reach for all kinematically allowed ADM masses with $\Lambda <\leq 1.62$ (1.1) TeV, assuming an integrated luminosity of 3000 (100) $fb^{-}1$.

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