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Non decoupling dark matter

We study non-composite dark matter as a beyond the Standard Model (BSM) extension under the Higgs Effective Field Theory (HEFT) framework, which describes necessarily non-linearly realised theories perturbed around the ground state after electroweak symmetry breaking (EWSB). We focus on scalar Loryon models that acquire more than half the particle's mass from the Higgs mechanism and found four surviving BSM candidates using experimental bounds already established, including the scalar singlet and electroweak doublet, triplet, and quartet, all assumed to be colourless and carry additional $\mathbb{Z}_2$ charge to prohibit further decay. We recreate the tree-level HEFT mapping of a singlet scalar BSM under the above assumptions and show that it does not have a linearly realised Standard Model Effective Field Theory (SMEFT), which perturbs the vacuum before EWSB. We numerically calculated the cosmic relic density constraint with the current value of $\Omega_{DM}h^2 \sim 0.12$ on the mass m_s and Higgs portal coupling strength λ_s of the BSM scalar singlet and compared with the Loryon assumption, which rules out the resonant region around half Higgs-mass $m_s \sim m_h/2$. We compare the result with previous studies and conclude that only the high-mass $m_s \gg m_h/2$ islands survive for the BSM scalar singlet if we accept that dark matter receives most of its mass from the Higgs.

Mini Symposia (Invited Talks Only)

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