

Smoking-Gun Signatures for Indirect Detection from Bound State Formation of Electroweak Multiplets

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Electroweak multiplets, i.e. n -plets which are colour singlets and are charged under the $SU(2)$ gauge group of the Standard Model, are the prototype of WIMP Dark Matter (DM). The phenomenology of these candidates is significantly affected by two non-perturbative effects: Sommerfeld enhancement and bound states formation (BSF). While the former has been the focus of many studies, the latter has received very little attention in the literature. However, BSF is an extremely promising effect for indirect detection DM searches: this effect implies the emission of photons with energies of $O(100 \text{ GeV})$ which lead to a distinct line in the spectrum of the gamma-ray flux arising from the DM annihilation, in addition to a hard line in the multi-TeV range, at an energy $E \sim M_{\text{DM}}$. The lines due to BSF are particularly prominent in the photon fluxes of multiplets with $n > 5$, and their correlation with the hard photon lines with $E \sim M_{\text{DM}}$ are clear smoking-gun signatures which can allow to test the theory with an unprecedented confidence level. In this talk, we show how this feature of the model is especially relevant in galaxy clusters, where the large relative velocity of the annihilating DM particles enhances the effect of the line, and how this can be used to potentially discover or rule out this class of candidates with the upcoming CTA telescope.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

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