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The Madala Hypothesis and Indirect Dark Matter Detection

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The Madala hypothesis, invoked by South African scientists (von Buddenbrock et al 2015 & 2016), extends the standard model to cover anomalies in the transverse momentum of the Higgs boson (among other anomalous excesses) seen at the Large Hadron Collider. As the evidence continues to hint in favour of this scenario it is worthwhile to explore its cosmological and astrophysical consequences. These arise as the effective field theory used includes a dark matter candidate whose Standard Model interactions are mediated by an additional scalar boson S.
In this work we will study the limits on the decay branching of the boson S following dark matter annihilation using data from the Coma galaxy cluster and Reticulum II dwarf galaxy. In so doing we will see that couplings of the S boson cannot be Higgs-like, contrary to what was originally assumed in the hypothesis for simplicity. This results in new constraints on the hypothesis independent of collider data.
We will also explore to what extent the Madala dark matter can explain the gamma-ray excess observed in the galactic centre, as well as other gamma-ray excesses claimed towards dwarf galaxies.

Summary

We examine the consequences of indirect dark matter searches on the recent Madala hypothesis (von Buddenbrock et al 2015 & 2016), designed to explain anomalies in LHC Higgs boson data by introducing several additional scalar particles. We do this in the Coma galaxy cluster as well as the Reticulum II dwarf galaxy, using both radio and gamma-ray data, to derive new constraints on the model independent of existing collider data.

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