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A global fit of the gamma-ray galactic center excess within the scalar Higgs portal model

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Summary

We present an interpretation of the excess in the gamma-ray emission from the center of our galaxy observed by Fermi-LAT in terms of dark matter annihilation within the scalar singlet Higgs portal model. In particular, we include the astrophysical uncertainties from the dark matter distribution and allow for unspecified additional dark matter components. We demonstrate through a detailed numerical fit that the strength and shape of the gamma-ray spectrum can indeed be described by the model in various regions of dark matter masses and couplings. Constraints from invisible Higgs decays, direct dark matter searches, indirect searches in dwarf galaxies and for gamma-ray lines, and constraints from the dark matter relic density reduce the parameter space to dark matter masses near the Higgs resonance. We find two viable regions: one where the Higgs-dark matter coupling is of O(0.01), and an additional dark matter component beyond the scalar WIMP of our model is preferred, and one region where the Higgs-dark matter coupling may be significantly smaller, but where the scalar WIMP can constitute a significant fraction or all of dark matter. Both viable regions are hard to probe in future direct detection and collider experiments.

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