Contribution ID: **94** Type: **not specified**

Hidden Sector Dark Matter Models for the Galactic Center Gamma-Ray Excess

The gamma-ray excess observed from the Galactic Center can be interpreted as dark matter particles annihilating into Standard Model fermions with a cross section near that expected for a thermal relic. Although many particle physics models have been shown to be able to account for this signal, the fact that this particle has not yet been observed in direct detection experiments somewhat restricts the nature of its interactions. One way to suppress the dark matter's elastic scattering cross section with nuclei is to consider models in which the dark matter is part of a hidden sector. In such models, the dark matter can annihilate into other hidden sector particles, which then decay into Standard Model fermions through a small degree of mixing with the photon, Z, or Higgs bosons. After discussing the gamma-ray signal from hidden sector dark matter in general terms, we consider two concrete realizations: a hidden photon model in which the dark matter annihilates into a pair of vector gauge bosons that decay through kinetic mixing with the photon, and a scenario within the generalized NMSSM in which the dark matter is a singlino-like neutralino that annihilates into a pair of singlet Higgs bosons, which decay through their mixing with the Higgs bosons of the MSSM.

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