

How to stop worrying about pulsars and start looking for dark matter: The Fermi Galactic center GeV excess and beyond

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One of the long-standing challenges in indirect dark matter searches is to understand the origin of the pronounced emission of 1-3 GeV photons that is seen in Fermi LAT data in the Galactic bulge and at the Galactic center. The arguably most exciting interpretation is that it is caused by the annihilation of dark matter particles. However, before making such a claim all possible backgrounds need to be assessed with utmost care. I will here show that in contrast to previous claims millisecond pulsars (MSPs) are a valid and rather likely explanation. What is more, the MSP hypothesis can explain the non-Gaussian noise that we detected in the gamma-ray emission from the inner Galaxy, with at least 10 sigma significance, using a new dedicated wavelet decomposition analysis. The power spectrum of dust-traced gas at small angular scales, as well as the projected density of other Galactic sources is far too low to account for this signal. I will present realistic strategies of how upcoming targeted radio searches and surveys can establish or refute the MSP hypothesis with high statistical significance. If we fail to find bulge MSPs in radio soon, the dark matter interpretation of the Fermi GeV excess will become much more likely again. I will close with an outlook on indirect dark matter searches in the next ten years.

Summary

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Track Classification: Indirect Dark Matter Detection