

New Challenges Facing Pulsar Interpretations of the Galactic Center Gamma-Ray Excess

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Abstract: It has been suggested that the Galactic Center gamma-ray excess could be produced by a large number of centrally-located millisecond pulsars. The fact that no such pulsar population has been detected implies that these sources must be very faint and very numerous. Using Fermi's recently released Third Pulsar Catalog, we measured the luminosity function of the millisecond pulsars in the Milky Way's Disk. If the gamma-ray excess were generated by millisecond pulsars with the same luminosity function, ~20 such sources from the Inner Galaxy population should have already been detected by Fermi. Given the lack of such observed sources, the hypothesis that the gamma-ray excess is generated by pulsars with the same luminosity function is excluded with a significance of 3.4σ . We conclude that either less than 39% of the GCE is generated by pulsars, or that the millisecond pulsars in the Inner Galaxy are at least 5 times less luminous (on average) than those found in the Galactic Disk.

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