

New mass bound on fermionic dark matter from a combined analysis of classical dSphs

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Dwarf spheroidal galaxies (dSphs) are the most compact dark-matter-dominated objects observed so far. The Pauli exclusion principle limits the number of fermionic dark matter particles that can compose a dSph halo. This results in a well-known lower bound on their particle mass. So far, such bounds were obtained from the analysis of individual dSphs. We model dark matter halo density profiles via the semi-analytical approach and analyse for the first time the data from eight ‘classical’ dSphs assuming the same mass of dark matter fermion in each object. We obtain a new 2σ lower bound of $m \gtrsim 190$ eV on the dark matter fermion mass. Besides, by combining a sub-sample of four dSphs – Draco, Fornax, Leo I, and Sculptor – we conclude that 220 eV fermionic dark matter appears to be preferred over the standard cold dark matter at about 2σ level. However, this result becomes insignificant if all seven objects are included in the analysis.

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