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Strong link between the dark matter identity and the origin of the supermassive black holes

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Supermassive black holes(SMBHs) more massive than billion solar mass are observed at redshifts around 6. Their origin is still unknown. Primordial black holes(PBHs) being their origin is one possibility. We propose a new method which can potentially falsify the PBH scenario as the explanation of the SMBHs. Based on the observation that large density perturbations required to create PBHs also result in the copious production of the ultracompact minihalos (UCMHs) of dark matter, we show that weakly interacting massive particles(WIMPs) as dark matter having sizable interaction strengths with the standard model particles, that are also typical in many extended standard models, annihilate efficiently inside the UCMHs to yield gamma-rays far exceeding the upper limit placed by the Fermi-LAT measurement. Therefore, if future terrestrial experiments identify dark matter as WIMPs having typical interaction strengths with the standard model particles, then our proposal indicates that the PBH scenario is strongly disfavored.

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