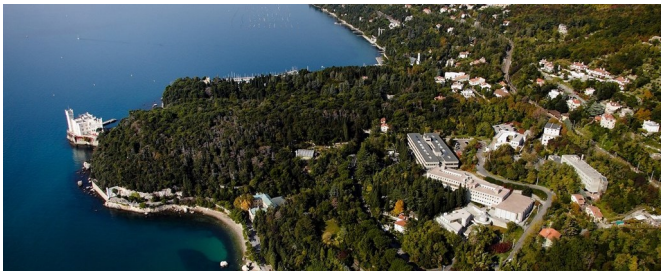

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Prospective multi-TeV Dark Matter spike at the Galactic Center: spectral, spatial and dynamical constraints

Tuesday 29 August 2023 17:00 (25 minutes)

We focus on the combined analysis of 5 concentric regions in the Galactic Center (GC), observed by the High Energy Stereoscopic System (HESS) in very high energy gamma-ray spectra, as a possible way to constrain the Dark Matter (DM) density distribution in a radius smaller than 450 pc. Inspired by the multi-TeV DM interpretation of the gamma-ray cut-off, detected by HESS in the inner 15 pc, we study the gamma-ray flux in different regions, determining the astrophysical factor on different angular scales. The latter will serve us to set constraints on the density distribution of the multi-TeV Weakly Interactive Massive Particle. Also, an extra study will be performed regarding dynamical constraints on the enclosed mass within the S2 star orbit, in order to compare them with the spectral constraints obtained and a wide range of DM density profiles. Our results are compatible with the hypothesis of an enhancement of the DM distribution in the GC, with respect to the benchmark Navarro-Frenk-White density distribution profile. Also, this enhancement could be created by a cuspy profile NFW with a slope $\gamma \sim 1.3$. However, the enhancement created by a DM adiabatic spike is ruled out by the HESS spectral data for almost all kinds of DM density profiles. We also show the results for other kinds of spikes, ruling out some profiles as well. Finally, we also conclude that the upper limits on the enclosed mass within the S2 orbit rule out profiles with slopes $\gamma > 0.8$ if a DM spike is considered.

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