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The viability of low-mass subhaloes as targets for gamma-ray dark matter searches

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In this talk, we investigate the discovery potential of low-mass Galactic dark matter (DM) subhaloes for indirect searches of DM. We use data from the Via Lactea II (VL-II) N-body cosmological simulation, which resolves subhaloes down to $\mathcal{O}(10^4)$ solar masses and it is thus ideal for this purpose.
First, we characterize the abundance, distribution and structural properties of the VL-II subhalo population in terms of both subhalo masses and maximum circular velocities. Then, we repopulate the original simulation with millions of subhaloes of masses way below the minimum VL-II subhalo resolution. We compute subhalo DM annihilation astrophysical "J-factors" and angular sizes for the entire subhalo population, by placing the Earth at a random position but at the right galactocentric distance in the simulation. Thousands of these realizations are generated in order to obtain statistically meaningful results.
We find that some nearby low-mass Galactic subhaloes, not massive enough to retain stars or gas, may indeed yield DM annihilation fluxes comparable to those expected from other, more massive and acknowledgeable DM targets like dwarf satellite galaxies. Typical angular sizes are of the order of the degree, thus subhaloes potentially appearing as extended sources in gamma-ray telescopes, depending on instrument angular resolution and sensitivity. Our work shows that low-mass Galactic subhaloes with no visible counterparts are expected to play a relevant role in current and future indirect DM searches and should indeed be considered as excellent DM targets.

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