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Search for Galactic dark matter substructures with Imaging Air Cherenkov Telescopes

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Weakly interacting, massive dark matter particles are expected to self-annihilate or decay into high-energy photons, which thereby establish the possibility for indirect detection by gamma-ray telescopes. For probing the dark matter annihilation products, accurate knowledge of the dark matter density distributions is crucial. However, major uncertainties exist in the density profiles of our Galaxy, neighboring spheroidal dwarf galaxies, and extragalactic targets.

The new public version of the semi-analytic code CLUMPY will be presented, which facilitates the fast calculation of astrophysical J-factors of arbitrary dark matter halos, including substructures. This code has been used for a careful study of the potential detection of Galactic dark matter substructures with present and future Imaging Air Cherenkov telescopes (IACT). In this presentation, two aspects will be considered in the light of recent constraints from other experiments: Firstly, a statement on the probability of finding single subhalos in IACT sky-surveys will be made. Secondly, the chance of detecting anisotropy patterns originating from dark matter substructures in the isotropic gamma-ray background will be examined. The impact of the different substructure models on these detection potentials will be discussed as well as the challenges for instrumental design and sensitivity.

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