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Multi-messenger observations of ultra-faint dwarf galaxies as probes of dark matter

Multi-messenger observations using next generation telescopes have great potential in understanding the nature of Dark Matter. DM indirect detection through observations with CTA and LHAASO (in the gamma ray domain) and KM3NeT (in the neutrino domain) can shed light upon the non-Gravitational properties of DM. The DM models under consideration in this work were proposed to explain the DAMPE excess flux detected by Wukong in late 2017 and all involve Weakly Interacting Massive Particles, with a mass on the TeV scale, coupled exclusively to Standard Model Leptons via a heavy mediator. We make use of simulations of the expected indirect emissions from the Annihilation and Decay of the WIMPs, in both gamma and neutrinos. We consider observations, in both domains, of two Dwarf Spheroidal galaxies in the Local Group. The target galaxies are chosen as Segue I and Tucana II – with four observations in total being proposed for the three telescopes under consideration. All target Dwarf Spheroidal galaxies are Ultra-faints with particularly high astrophysical J and D factors. Using conservative estimates of telescope sensitivities, we forecast non-detection upper bounds upon the free parameters - the WIMP Annihilation Cross Section and the Decay Rate respectively.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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