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Exotic dark matter searches in dwarf spheroidal galaxies with the MAGIC telescopes: From secluded and branon DM to probing DM annihilation into neutrinos

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One of the most pressing questions for modern physics is the nature of dark matter (DM). Several efforts have been made to model this elusive kind of matter, whose presence has been assessed only by gravitational effects so far. The largest fraction of DM cannot be made of any of the known particles of the Standard Model (SM). The ground-based gamma-ray telescope system MAGIC could potentially detect DM indirectly, by observing secondary products of either its annihilation into SM particles or its annihilation into short-lived mediators decaying into SM particles. We present a collection of exotic DM searches in dwarf spheroidal galaxies (dSphs) with the MAGIC telescopes. At first, we focus on brane-world theory as a prospective framework for DM candidates beyond the SM of particle physics. Secondly, we explore secluded DM by introducing short-lived mediators in the annihilation process. Last, we probe the DM annihilation into neutrinos, which produce a non-negligible fraction of gamma-rays and charged leptons in the final state. We present the cross-section limits as a function of the DM particle mass obtained by using a joint binned likelihood analysis, with the inclusion of systematic uncertainties in the residual background intensity and statistical uncertainties in the DM content of the dSphs.

Track

Dark Matter

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