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Limits to dark matter properties from a combined analysis of MAGIC and Fermi-LAT results

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The existence of a non-baryonic, neutral and weakly-interacting dark matter component in the Universe is supported by an overwhelming body of experimental evidence. A promising way to try and identify the dark matter particle, and to measure its properties, is to search for the gamma rays produced by annihilation and/or decay in dark matter overdensities in the local Universe. Gamma-ray instruments like the Fermi-LAT (in space) and the MAGIC telescopes (on the ground) are sensitive to overlapping and complementary ranges of dark matter particle mass (from ˜100 MeV to ˜100 TeV), and have dedicated programs to look for such signals coming from, e.g., the Galactic center, galaxy clusters, and dwarf satellite galaxies.

The universality of dark matter properties allows the combination of results from different experiments and/or observational targets into a global, more sensitive search. For a given dark matter particle model, a joint likelihood function can be defined as the product of the particular likelihood functions for each of the measurements/instruments. Using such an approach has the advantage that the details of each experiment do not need to be combined or averaged. We have implemented this analysis framework and applied it to combine the results recently published by the MAGIC and Fermi-LAT Collaborations on observations of dwarf satellite galaxies. In this talk, we present the analysis method and the obtained results. The applied approach is completely general and could be used in the future to merge our results with those from other instruments (H.E.S.S., VERITAS, CTA and/or HAWK), sensitive to the same region of the dark matter parameter space.

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