Contribution ID: **573** Type: **talk**

Global dark matter limits from a combined analysis of MAGIC and Fermi-LAT data

Thursday 23 July 2015 10:45 (15 minutes)

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, and have dedicated programs to look for dark matter signals coming from the Galactic Center, galaxy clusters, dwarf satellite galaxies and others. The universality of dark matter properties allows the combination of data from different experiments and/or observational targets into a global and sensitive-optimized search. For a given dark matter particle model, a joint likelihood function can be written as the product of the particular likelihood functions for each of the measurements/instruments – the advantage of such an approach is that the details of each experiment do not need to be combined or averaged. We have implemented this analysis framework and applied it to the MAGIC and Fermi-LAT observations of dwarf satellite galaxies. Here we present the analysis method and the obtained results: the most constraining bounds to dark matter properties for masses between 10 GeV and 100 TeV from dwarf galaxies observations. The approach is completely generic 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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Session Classification: Astroparticle Physics, Cosmology, Gravitation

Track Classification: Astroparticle Physics, Cosmology, Gravitation