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High-energy gamma-ray observations above 10 GeV with CALET on the International Space Station

Masaki Mori, Ritsumeikan University, for the CALET collaboration

Gamma-ray events above 10 GeV observed during five years of operation of the CALET detector onboard the International Space Station have been analyzed to search for possible line signals in the energy spectra assuming various region-of-interests of the sky depending on the proposed Galactic halo density profile models. We found no hint of line signals and gave upper limits on parameters of the dark matter (DM) annihilation and decay models, although these limits, taking account of only statistical errors, are still preliminary.

Our velocity-averaged cross section limits lie in the range $\langle\sigma v\rangle_{\gamma\gamma} \sim 10^{-28}$–$10^{-25}$ cm^3 s^{-1}, with the precise limit depending on the DM mass and the DM density profile assumed for the Galaxy (Fig. 1); gentler profiles which produce wider distribution around the Galactic center are constrained more strongly, mainly because of limitation by our event statistics. Our limits on the DM decay lifetime extends above 10^{30}s for m_{DM}> 100 GeV (Fig. 2). We are now studying possible systematic errors in our limits.

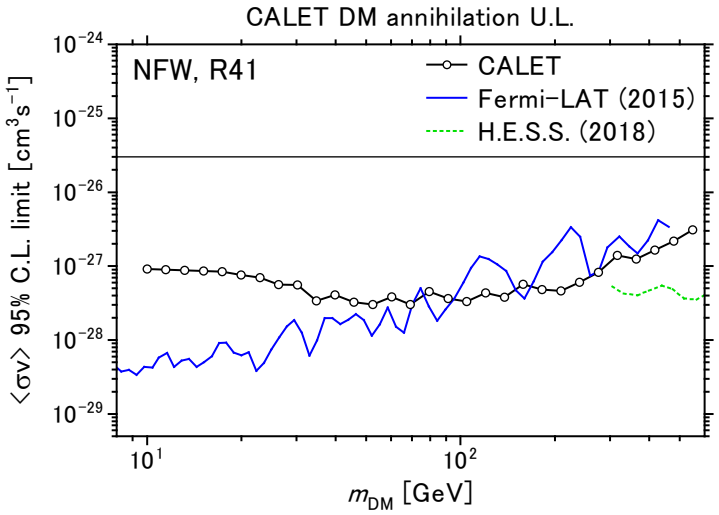

Fig.1: Upper limits on DM velocity-averaged annihilation cross section as a function of the DM mass for the NFW profile of the Galactic halo density. Region-of-Interest (ROI) in this case is within 41 degree from the Galactic center.

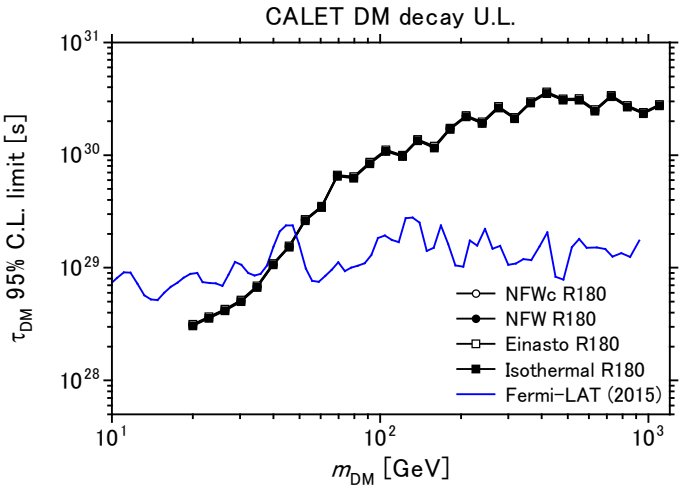

Fig.2: Upper limits on DM decay lifetime. They are almost independent on assumed the Galactic halo profiles. Also shown are those given by Fermi-LAT. Region-of-Interest (ROI) in this case is within 180 degree from the Galactic center (i.e. all sky).