CHALLENGES OF INDIRECT DETECTION OF LOW MASSE (BELOW 50 GEV) DARK MATTER

M. Cirelli

Laboratoire de Physique Théorique et Hautes Energies (LPTHE), UMR 7589 CNRS & UPMC, 4 Place Jussieu, F-75252, Paris, France

email: marco.cirelli@gmail.com

Indirect detection (ID) of Dark Matter (DM), i.e. the search for cosmic rays produced by DM annihilations or decays in the galactic halo or beyond, is usually considered as a promising approach, rightly so. However, when DM is relatively light (in the sub-WIMP region, to fix the ideas), the technique faces some challenges, essentially because some uncertainties related to astrophysics become too important. This refers in particular to antiprotons and gamma rays. Concerning antiprotons, the main effect is due to solar modulation: the modification of the spectra of low energy charged particles due to the activity of the Sun is not enough well known hence the constraining power of antiproton measurements is compromised. This for instance does not allow a firm statement on antiproton constraints on the GeV Galactic Center excess (see the first two panels of fig. 1, based on [1]). Concerning gamma rays, an important effect is due to the inclusion or not of secondary radiation (Inverse Compton, bremsstrahlung, synchrotron radiation), which is intrinsically environment-dependent: the poor knowledge of the properties of such environment (gas density, strength of the magnetic field etc) impacts the precision of the ID predictions., as for instance illustrated in the case of bremsstrahlung radiation in the last panel of fig. 1 (based on [2]). These two examples will be discussed, plus possible strategies for improvements.

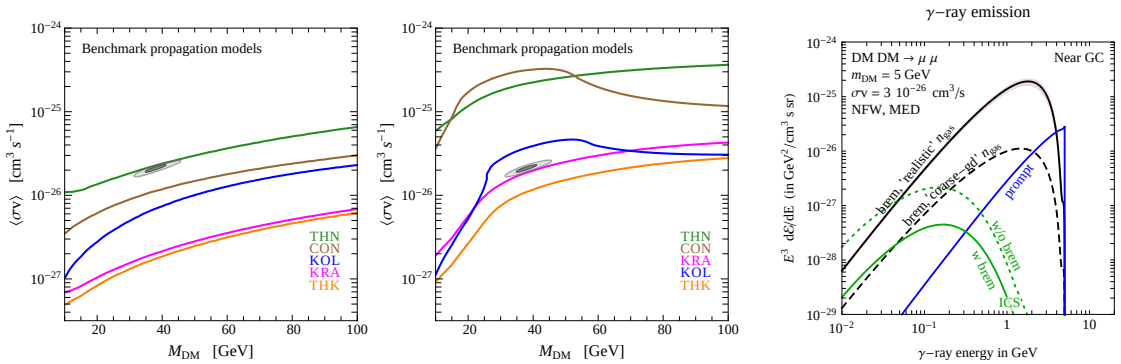

Figure 1: Antiproton constraints on the DM interpretation of the GC GeV excess, assuming fixed (left) or essentially free (middle) parameters for solar modulation.

[1] M. Cirelli et al., JCAP **1412** (2014) 12, 045, arXiv:1407.2173.

[2] M. Cirelli, P. D. Serpico and G. Zaharijas, JCAP **1311** (2013) 035, arXiv:1307.7152.