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DRAGON 2: implications for dark matter searches

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Summary

We present DRAGON 2, a numerical package designed to solve a general version of the cosmic-ray (CR) transport equation including all the relevant physical processes: diffusion, reacceleration, energy losses, advection, spallation.

The new version contains significant update and has been documented in full detail.

The code computes CR propagation for all species, both hadronic —including heavy nuclei – and leptonic, originating from astrophysical processes and also from dark matter annihilation or decay. The propagation can be followed in 2D and 3D mode, and the full detail of the Galactic structure (spiral-arm pattern, central molecular zone) can be considered.

This numerical package, together with auxiliary tools computing gamma-ray, neutrino and synchrotron emission, is able to provide a deep insight on the astrophysical backgrounds representing the major challenge in all indirect dark matter detection attempts.

In particular, since the code is able to to explore with high resolution the structures in the Galactic bulge, and to model CR anisotropic escape via diffusion and advection, it represents a crucial tool in the perspective of a better understanding of the anomalous gamma-ray emission detected in the inner Galaxy. Moreover, the possibility to keep all channels under control in a consistent way allows to characterize all the related constraints (e.g. coming from antiproton data or other CR observables). The modular and general structure of the code is especially designed to consider different problems on different scales, and the package can be easily adapted and scaled to study smaller or larger systems (from the solar neighborhood to clusters of galaxies).

We show in this talk the main features of the code, the expected future developments of the project, with particular focus on the most relevant current and future applications for any DM-oriented study.

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