

Untangling the Complexity in the Galactic Centre: a way to understand the origin of the gamma-ray emission from the inner Galaxy

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The origin of the high-energy gamma-ray emission from the Milky Way centre is still unclear and debated because of the impact of systematics afflicting the measurements from current experiments. Several theories and phenomenological models attempt to explain the intricate panorama. The presence of a *PeVatron* in the Central Molecular Zone or in its vicinity, the contribution of the hard component of the diffuse gamma-ray emission, and dark matter annihilation scenario are among the most promising mechanisms to describe the observed excess. The development of increasingly precise models able to reproduce the measured gamma-ray emission is the challenge for the scientific community in view of the next generation telescopes.

A detailed treatment of phenomenological models for the dubbed *Cosmic Rays Sea* (CR-sea) characterised by different configurations is scrutinised in comparison with the observed spectra in several regions of the inner Galaxy using recently distributed DRAGON2 and HERMES codes. Updated maps of atomic and molecular components of the gas distribution in Our Own Galaxy are considered, as well as the systematics arising from the analysis of *Fermi*-LAT data performed with different approaches.

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Primary author: VENTURA, Sofia (University of Siena & INFN Pisa)

Presenter: VENTURA, Sofia (University of Siena & INFN Pisa)

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