



Cosmic Interacting Matters – From Source to Signal

Seminar

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Modeling the Galactic Center gamma-ray emission by cosmic rays

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HESS observed an extended gamma-ray emission correlated with the morphology of the central molecular zone in the Galactic center. The most accepted scenario to generate this emission is via a hadronic interaction between cosmic rays and ambient gas. In this work, we explore the influence of the 3-D shape of the central molecular zone on the indirect observation of the cosmic rays and verify if more realistic cosmic-ray dynamics for the Galactic center environment are consistent with current gamma-ray observations. We found that using a proton source consistent with particles accelerated in the persistent Wolf-Rayet wind collision in the central 0.5 pc and a simplified cosmic-ray diffusion, a disk-like gas distribution is needed to reproduce the existing gamma-ray observations. However, it contradicts several models of the central molecular zone, which imply that this structure has a significant inner cavity. This tension can be reconciled by an additional impulsive cosmic-ray injection from SN Sgr A East. Additionally, in order to reproduce the existing observations adopting more realistic cosmic-ray dynamics, a ring-like gas distribution and cosmic-ray acceleration from the Arches, Quintuplet, and Nuclear clusters, plus SN Sgr A East are required.

All that are interested are very welcome!

