ID de Contribution: **103** Type: **Non spécifié**

Gamma-ray emission from CR-ISM interactions in star-forming galaxies

jeudi 30 juin 2011 14:20 (20 minutes)

Cosmic-rays with energies up to the PeV are very likely related to stellar phenomena. As they propagate away from their sources, cosmic rays illuminate the various components of the interstellar medium and give rise to emissions in the radio and gamma-ray bands. The resulting galaxy-wide radiation can provide insights into the physics of cosmic-ray acceleration and transport. The recent observations of gamma-ray emission at GeV and TeV energies from several nearby star-forming galaxies has opened the way for population studies, allowing to compare the diffuse gamma-ray emission from different systems. The dependence of the gamma-ray luminosity of these objects on some of their large-scale properties can provide constraints on the processes that rule cosmic-ray populations at galactic scales. After a review of the detections achieved so far for several Local Group objects and two nearby starbursts, we present the outcome of a systematic search for GeV emission from a large sample of star-forming galaxies using Fermi/LAT. These results are then discussed in the context of a simple model for the gamma-ray emission of star-forming galaxies.

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Classification de Session: Diffuse emission and cosmic ray interaction with interstellar matter