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TeV gamma-ray halos

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“The detection of extended multi-TeV gamma ray halos around pulsars provides a unique tool to investigate the propagation of cosmic rays in the magnetized turbulent interstellar medium around sources. Such emission has been analyzed in the framework of isotropic diffusion, invariably leading to infer a diffusion coefficient in the source region two-three orders of magnitude smaller than that typically found in models of Galactic cosmic ray transport. Attempts to explain such suppression and/or to reconcile it with typical diffusion coefficients, exploited a variety of effects, such as anisotropic diffusion and turbulence self-generation by the escaping particles, which however have problem in explaining the morphology, or the transition between ballistic and diffusive propagation, which can require an unrealistically large acceleration efficiency. Here we provide an overview of the proposed scenarios, discussing the entailed theoretical advantages and difficulties, and the implied observational signatures. We also discuss how the high sensitivity and large FoV of LHAASO, combined with the superior angular resolution of future IACTs, such as ASTRI Mini-Array and CTAO, may allow to distinguish such features and possibly lead to disentangle among the proposed transport models.”

Presenter: RECCHIA, Sarah

Session Classification: Saturday Afternoon A