Contribution ID: **235** Type: **not specified**

Simulating TeV gamma-ray morphologies of shell-type supernova remnants

Wednesday, 13 September 2023 14:30 (15 minutes)

Supernova remnants shocks are considered the best sites for the production of Galactic cosmic rays. The interactions of cosmic rays produced at supernova shocks with photon fields and the interstellar medium generate a multi-wavelength spectrum from radio to gamma rays. In particular, TeV gamma-ray emission may originate from both hadronic and leptonic interactions. Recent results from kinetic simulations suggest that the acceleration of cosmic ray ions strongly depends on the relative angle between the shock normal and the local magnetic field orientation. This means that the underlying topology of the interstellar magnetic field in which the supernova remnant expands determines the emission morphology.

Using 3D magneto-hydrodynamical simulations with the code AREPO, we study the effect of the obliquity dependent shock acceleration on the emission morphology of bright supernova remnants. We apply the results of idealised cases to well-known bright supernova remnants assuming a hadronic model to reproduce different emission morphologies. From the TeV gamma-ray morphology we predict the local composition of the interstellar medium and the coherence scale of the interstellar magnetic field. Furthermore we study the impact of different interstellar environments, such as the case of a clumpy medium for core-collapse supernova remnants. We show that the hadronic model provides a good match for both the observed morphologies and the spectra.

Primary author: PAIS, Matteo (The Hebrew University of Jerusalem)

Co-authors: Prof. PFROMMER, Christoph (Leibniz Institute for Astrophysics); Dr EHLERT, Kristian (Leibniz Institute for Astrophysics); Dr WINNER, Georg (Leibniz Institute for Astrophysics); Dr WERHAHN, Maria (Max Planck Institute for Astrophysics)

Presenter: PAIS, Matteo (The Hebrew University of Jerusalem)

Session Classification: CCR: Charged Cosmic Ray

Track Classification: Charged Cosmic Rays