

Time-dependent treatment of cosmic-ray spectral steepening due to turbulence driving

Friday 16 July 2021 12:00 (12 minutes)

Cosmic-ray acceleration at non-relativistic shocks relies on scattering by turbulence that the cosmic rays drive upstream of the shock. We explore the rate of energy transfer from cosmic rays to non-resonant Bell modes and the spectral softening it implies. Accounting for the finite time available for turbulence driving yields a much smaller spectral impact than found earlier with steady-state considerations. Generally, for diffusion scaling with the Bohm rate by a factor η , the change in spectral index is at most η divided by the Alfvénic Mach number of the thermal sub-shock. For small M_A it is well below this limit. Only for very fast shocks and very efficient cosmic-ray acceleration the change in spectral index may reach 0.1. For standard SNR parameters it is negligible.

Keywords

Gamma-ray astronomy ; cosmic rays ; supernova remnants ; spectral index

Collaboration

other Collaboration

Subcategory

Theoretical Results

Primary author: POHL, Martin (Z_THAT (Theoretische Astroteilchenphysik))

Presenter: POHL, Martin (Z_THAT (Theoretische Astroteilchenphysik))

Session Classification: Discussion

Track Classification: Scientific Field: MM | Multi-Messenger