Modeling SNRs with a Simple Model of Non-Linear Shock Acceleration

Donald C. Ellison (NCSU)

A simple, approximate model of nonlinear diffusive shock acceleration is used to produce proton and electron spectra from supernova remnant (SNR) blast waves. These spectra are then used to generate broad-band photon spectra from radio to TeV γ-rays which can be compared with observations. The model uses a three-power-law approximation to the concave superthermal momentum spectrum expected from shock acceleration, plus a thermal peak at the shocked plasma temperature, to yield complete spectra. Photons are produced by bremsstrahlung, synchrotron, inverse-Compton, and pion-decay preocesses. While quick and easy to use for fitting data, the model contains the essential physics seen in more complete (and computationally intensive) numerical solutions.