

COMPLEX ELECTRON DISTRIBUTIONS IN SNR WITH NON-THERMAL X-RAYS

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We address the problem of the diffusive acceleration of electrons in shocks of supernova remnants with non-thermal X-ray emission. A complex electron energy distribution develops, with energies within the range from thermal to highly relativistic energies.

Starting from a Maxwellian distribution, drift acceleration produces, within the finite-size layer of the shock, a steep power-law suprathermal electron energy distribution. Diffusive shock acceleration then produces an $\tilde{E}^{-2.42 \pm 0.04}$ spectrum (Biermann, 1993). We find that at higher energies the spectrum steepens, due to the existence of the individual blob shocks, substructure of the shock region (observed in radio emission).

We discuss the consequences of this for X-ray emission in SNR showing non-thermal emission. This may be a paradigm for acceleration of energetic electrons also in other astrophysical sites, such as clusters of galaxies.