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Particle acceleration in twisted coronal loops: effect of collisions and magnetic convergence

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Twisted magnetic fields are ubiquitous in the corona. Recent theoretical studies suggest that development of kink instability in twisted coronal loop and following magnetic reconnection can be a viable model for small self-contained flares.

Using the combination of 3D MHD and adiabatic test particle simulations we study kinetics of non-thermal particles accelerated during magnetic reconnection in flaring twisted coronal loop. Particular emphasis is put on the effects of collisional scattering and magnetic mirroring of particles near the loop footpoints. It is shown that such the acceleration model can provide the number of high-energy electrons and acceleration efficiency comparable to those obtained from observations of small flares. Based on our theoretical energy spectra and spatial distributions of accelerated particles we derive various characteristics of hard X-ray emission sources and compare them with RHESSI observations.