Observation of supernova remnants with the CAT Cherenkov imaging telescope

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Supernova remnants (SNR) can be broadly classified into two types: plerionic or plasma-filled SNR, like the Crab Nebula, and shell-type SNR, like Cassiopeia A (Cas A), where the emission is concentrated rather in a shell-like region, believed to be the shock front where the supernova expansion impinges on surrounding material. For plerions, the high-energy gamma-ray emission is generally interpreted in terms of a synchrotron self-Compton (SSC) model (de Jager et al). The observed non-thermal X-ray emission from Cas A strongly indicates the presence of TeV electrons which can produce high-energy gamma rays by bremsstrahlung. The inverse Compton scattering of these gamma rays can further give rise to Very High Energy (VHE) radiation, which can be further supplemented at the highest energies by gamma-rays arising from the decay of π^0's created in nucleonic interactions of an associated high-energy cosmic-ray component (Baring et al, Ellison et al).
VHE observations of the Crab Nebula and Cas A, made with the CAT atmospheric Cherenkov imaging telescope are used to constrain models for production of gamma rays in SNR. For both plerionic and shell-type SNR, these observations serve primarily to impose a limit on the magnetic field in the region where the particles are accelerated.