NONTHERMAL X-RAY EMISSION FROM YOUNG SUPERNOVA REMNANTS

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The Galactic (nucleonic) cosmic-ray spectrum up to the knee ($E \sim 10^{15}$ eV) is believed to originate from acceleration processes occurring at supernova remnant shocks. This idea is confirmed by theoretical predictions, which give a similar estimate for the maximum particle energy, which can be reached at these shocks.
Electrons with energies $E \sim 10^{14}$ eV radiate X-ray photons in the $\sim 10 - 100$ μG magnetic fields present in many young SNRs. These electrons (near the knee), give rise to a nonthermal X-ray component in the spectrum of young supernova remnants. Recent observations of SN1006 and G347.3-0.5 confirm this prediction.
We have combined hydrodynamical calculations of the evolution of a young remnant with an algorithm which simultaneously calculates the associated particle acceleration, in the test-particle approximation.
We present the resulting synchrotron maps, at different X-ray frequencies, and photon spectra of the synchrotron radiation. Our method allows for calculating photon and electron spectra at different regions of the remnant.