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Poster paper

RADIO EVOLUTION OF SUPERNOVA REMNANTS INCLUDING NON-LINEAR PARTICLE ACCELERATION

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Supernova remnants (SNRs) are believed to accelerate particles up to high energies through the mechanism of diffusive shock acceleration (DSA). Radio emission from cosmic ray (CR) electrons supports this picture.

We use two-dimensional hydrodynamic simulations of SNRs coupled with particle acceleration and magnetic field amplification at non-relativistic shocks to derive the total radio emission. We take into account the dynamical reaction of the accelerated particles on the shock wave. We coupled a simple Blasi's semi-analytical model that deals with these non-linear effects in a quantitative way and changes hydrodynamics by means of an effective adiabatic index. Bell's cosmic-ray non-resonant streaming instability is considered to be responsible for the amplification of precursor magnetic field.

We obtained the radio synchrotron surface brightness increasing with time in the free expansion phase, achieving its peak value at the beginning of the Sedov phase and then decreasing during later phases. The dependence of the radio surface brightness on the diameter (time) has been calculated for different values of the interstellar medium density, supernova explosion energy, injection efficiency and different initial ejecta clumping, covering the region of the existing experimental points.