

# Efficient cosmic ray production in the supernova remnant RX J1713.7-3946

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**Abstract.** A nonlinear kinetic theory of cosmic ray (CR) acceleration in supernova remnants (SNRs) is employed to investigate the properties of SNR RX J1713.7-3946. Observations of the nonthermal radio and X-ray emission spectra as well as the H.E.S.S. measurements of the very high energy gamma-ray emission are used to constrain the astronomical and CR acceleration parameters of the system. It is argued that RX J1713.7-3946 is a core collapse supernova (SN) of type II/Ib with a massive progenitor, that it has an age of about 1600 yrs and is at a distance of about 1 kpc, and that the CR injection/acceleration takes place uniformly across the shock surface. The theory gives a consistent description for all the existing observational data, very roughly also concerning thermal X-rays. Specifically it is shown that an efficient production of nuclear CRs, leading to strong shock modification, and a large downstream magnetic field strength  $B$  of about 100 microGauss can reproduce in detail the observed synchrotron emission from radio to X-ray frequencies together with the gamma-ray spectral characteristics as observed by the H.E.S.S. telescopes. The source is consistent with RX J1713.7-3946 being an efficient source of nuclear cosmic rays.

**Keywords:** Supernova remnant RX J1713.7-3946, efficient particle acceleration, nonthermal emission