

Escape-limited maximum energy at perpendicular shocks in the interstellar magnetic field

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What is this contribution about?

We present the escape process from the perpendicular shock region of the SNRs in the ISM and the time evolution of the maximum energy limited by the escape from the perpendicular shock region.

Why is it relevant / interesting?

Although it is believed that supernova remnants can accelerate cosmic rays to PeV, we have not fully understood what types of supernova remnants can accelerate cosmic rays to PeV, and which shocks (parallel shocks and perpendicular shocks) can accelerate cosmic rays up to PeV.

What have we done?

For a perpendicular shock of a spherical shock in the ISM magnetic field, we investigated the escape process from the acceleration region, the size of the acceleration region that the rapid acceleration realizes, and the time evolution of the escape-limited maximum energy.

What is the result?

We showed that the rapid perpendicular shock acceleration is realized about 20% area of the whole SNR surface, which is much larger than the size of the superluminal shock region, and that the escape-limited maximum energy is about a few 10 TeV. We concluded that the typical type Ia SNRs cannot accelerate CRs to PeV without the upstream magnetic amplification.