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UHECR acceleration at GRB internal shocks

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Recent results from Auger suggest that there might be a significant heavy component in high energy cosmic rays. It is therefore interesting to explore the possibility to accelerate not only protons but also complex nuclei in relativistic jets. We developed a numerical tool inspired by the work done by Niemiec and Ostrowski (04) to compute the acceleration of particles at mildly relativistic shocks. This code includes energy losses of protons and nuclei and handles particle escape from the jet according to specific prescriptions, which can be adapted to different astrophysical environments and physical conditions. We first applied our code to the case of GRBs internal shocks. Physical quantities and their time evolution, relevant to cosmic-ray acceleration and energy losses, are estimated using the internal shock model of Daigne & Mochkovitch (98). We calculated the cosmic rays escaping from the jet environment but also secondary photons and neutrinos (produced both during the acceleration process and the UHECRs extragalactic propagation). The conditions for GRBs internal shocks to be the sources of UHECRs as well as the role of the key physical parameters are discussed.

Collaboration

– not specified –

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