

Latest result on searching for fractionally charged particles with the DAMPE

The existence of fractionally charged particles (FCP) is foreseen in extensions of or beyond the Standard Model of particle physics. Most of the previous studies of cosmic-ray FCP are based on observations by underground experiments, searching for FCP with the energy of hundreds of GeV. On-orbit experiments are able to look for FCP above a few GeV, but up to now the investigation in this field has been carried out only by the AMS-01 detector on-board of the Space Shuttle and the balloon-borne experiment BESS.

The DArk Matter Particle Explorer (DAMPE) is a space telescope launched on December 17th, 2015. One of the main goals of DAMPE is the measurement of galactic cosmic rays with energy up to several tens of TeV and beyond. In this work, we will introduce the results of searching for $2/3$ FCP in space obtained from the analysis of on-orbit data collected by the DAMPE detector. The FCP is assumed to be a heavy lepton, and the Geant4 simulations toolkit is adopted to investigate FCP's behavior in the DAMPE detector. No positive evidence for such particles is observed in five years of observation. Thus, we drive an FCP flux upper limit of $6.2 \times 10^{-10} \text{ cm}^{-2}\text{sr}^{-1}\text{s}^{-1}$. Our result refreshes the record in sensitivity among similar-type experiments by three orders of magnitude, which also more stringently restricts the conditions for the existence of FCP in primary cosmic rays

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