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Latest results and prospect on searching for fractionally charged particles with the DAMPE experiment

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The existence of fractionally charged particles (FCP) is foreseen in extensions of or beyond the Standard Model of particle physics. The FCP is commonly assumed to be a kind of heavy lepton-like particle which is searched in cosmic-rays by underground and space experiments like DAMPE. The Dark Matter Particle Explorer (DAMPE) is a space telescope launched on December 17th, 2015 and taking data since then. 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 $2/3e$ lepton-like FCP in space obtained from the analysis of on-orbit data collected by the DAMPE detector. No positive evidence for such particle is observed in five years of observation, thus, we derive an FCP flux upper limit of $6.2 \times 10^{-10} \text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$ with kinetic energy above $\sim \text{GeV}$. 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. We will also introduce the preliminary work on the searches of a light-mass FCP.

Primary author: Dr LIU, Chengming (INFN)

Presenter: Dr LIU, Chengming (INFN)

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