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Features Analysis of Particle Tracks and Sensitivity Estimation in PandaX-III Experiment

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The study of Majorana neutrinos is a hot research topic in the field of particle physics for exploring physics beyond the Standard Model. Neutrinoless double beta decay (NLDBD) is a rare nuclear decay process that can confirm the Majorana nature of neutrinos experimentally. The PandaX-III collaboration aims to build a globally competitive experiment with a hundred-kilogram target mass, utilizing a high-pressure xenon gaseous time projection chamber based on Micromegas to search for the NLDBD process of ^{136}Xe. Its significant advantage lies in the ability to discriminate signals from the background through the characteristic of charged particle tracks, thereby greatly improving the experimental sensitivity to NLDBD. This work focuses on the analysis of charged particle track features in the PandaX-III experiment and introduce methods such as particle track reconstruction and event vertex reconstruction to advance PandaX-III towards a zero-background experimental condition.

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