

# 托克马克中相对论性粒子导心轨道分类

## 摘要

本工作研究了托克马克中相对论性粒子导心轨道的分类问题，分析了相对论效应对高能电子轨道动力学的影响。通过比较非相对论和相对论情况下的拉格朗日量，发现相对论效应对轨道分类的影响主要体现在能量项的变化上，而非轨道类型的存在性。研究表明，相对论修正会导致相图上分界线的平移或形变，为理解高能电子在低密度等离子体或破裂阶段的共振过程提供了理论支持。

## 关键词

逃逸电子、托克马克、导心运动

## Abstract

In this work, the classification of relativistic particle guide orbits in tokamak is studied, and the influence of relativistic effect on the dynamics of high-energy electron orbits is analyzed. By comparing the Lagrangian quantities in non-relativistic and relativistic cases, it is found that the influence of relativistic effect on orbital classification is mainly reflected in the change of energy term, rather than the existence of orbital type. The study shows that the relativistic correction will lead to the translation or deformation of the boundary on the phase diagram, which provides theoretical support for understanding the resonance process of high-energy electrons in low-density plasma or disruption stage.

## Keywords

runaway electron, tokamak, guiding-center motion

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