

Dear Editor,

This paper presents a **direct numerical simulation** of the anomalous Doppler resonance between test electrons and an electromagnetic wave in the presence of a static electric field aligned with a background magnetic field, using a **volume-preserving method**.

Our key finding is the identification of a **critical threshold** for the strength of a left-hand circularly polarized electromagnetic wave, beyond which electrons become trapped in the resonant condition. Unlike traditional trapping mechanisms—such as Landau trapping or magnetic well trapping, this phenomenon arises from a **competing process** between parallel acceleration and pitch-angle scattering. When the energy gain from the static electric field is balanced by scattering into perpendicular gyrokinetic energy and wave interactions, the electron ceases further acceleration and remains in anomalous doppler resonance.

Building on these numerical results, we further analyze wave dynamics in **cold plasma**, considering resonance conditions and wave polarization. Our analysis reveals that the **extraordinary wave (X-wave)** is the most susceptible mode for anomalous doppler effect, suggesting a potential application in **runaway electron suppression** in future tokamak operations.

We believe this work provides valuable insights into **wave-particle interactions** in magnetized plasmas and could contribute to **fusion plasma control strategies**. We would be honored to have this manuscript considered for publication in your esteemed journal.

Thank you for your time and consideration.

Sincerely

Xinhang Xu

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