The impact of downstream heating on ion acceleration for collisionless electrostatic shock

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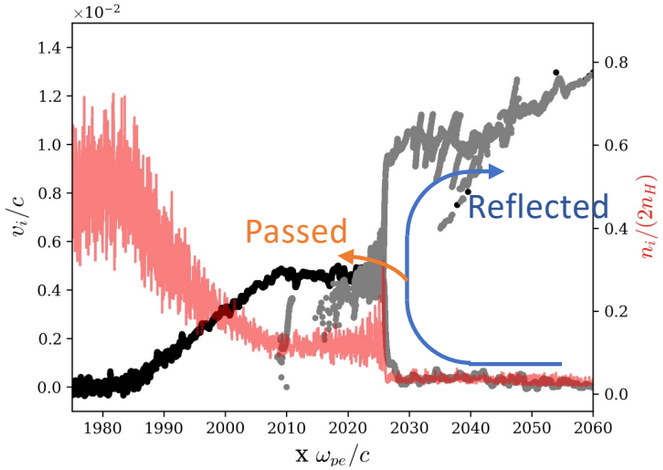
Motivation: Ion reflection in collisionless electrostatic shock (CES)

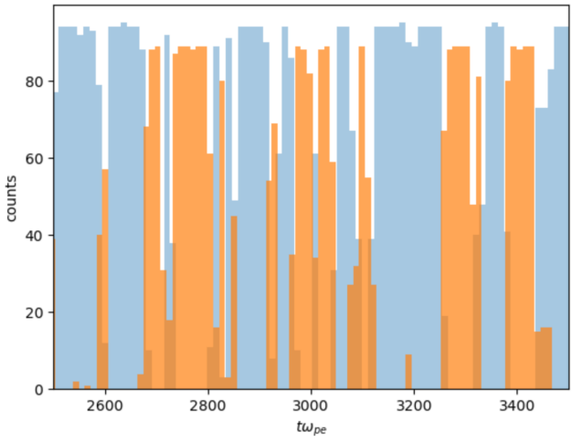
- CES is a common structure in space plasmas and a prominent laser-driven ion acceleration scheme using near critical density target.
- Ion reflected at the shock front is important to achieve high energy focus beam in laser-driven scheme and ion-acoustic wave generation.
- The details of ion reflection is still largely unknown, particularly for cold ions cases



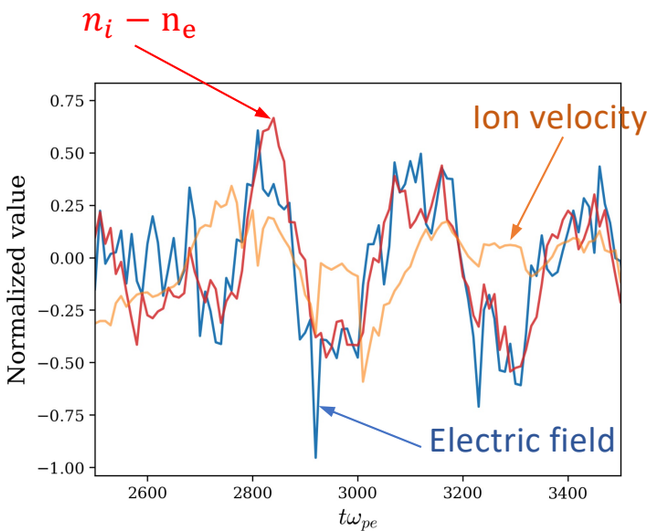
Time-dependant and intermittent nature of ion reflection

- By tracking a large sample of ions in our simulations, we found that ions are reflected in intermittent short bursts contradicting to common view of ion reflection as a static process.

Number of passing ions (blue) and reflected ions (orange) interact with the shock front



Variation at the shock front



Ion wave responsible for the reflection

- We believe that the fluctuation of electric field as the shock front is directly responsible for reflecting ions.
- Our study suggest that the fluctuation may cause by electrostatic ion waves with the most dominant mode $\sim 3\omega_{pi}^{-1}$ (ω_{pi} is the ion plasma frequency)
- Our future study will focus on clarify the trigger mechanism of these waves.