Using total time of 1e-5, time step of 1e-11, UeX of 0.1c, total cell number of 1000. for each time step electron travels 60% of one cell.

The source rate is setup based on ionisation efficiency of 0.22, ie assume 0.22% of electron collide with a neutral particle and lost to form an ion. At each time step a superparticle will be spawned at the specified position, with correct super-size to maintain the N\_dot parameter. The ionisation efficiency is simulated by multiplying the supersize by the factor, eg. Ion\_super\_size = Ni/N = 0.22\*N\_dot\*spawnTimeStep/1

For a regular ambipolar diffusion, flux of electron = flux of ion, and Fick’s Law diffusion coefficient for ion is doubled (D\_a = 2\*D\_i), given mobility of electron is much larger than that of ion. Therefore, the position of electron injection may affect the total flux of the chamber.

The injection rate study at 0.1c:

0:

A screenshot of a computer

Description automatically generated

Plasma wave, symmetric momentum

1e18:

A screenshot of a computer

Description automatically generated

A graph of a graph

Description automatically generated

1e20 /s:

Ion momentum and thrust plot:

A screenshot of a computer

Description automatically generated

A graph of a graph

Description automatically generated

This case breaksdown because velocity of electron inside chamber exceeds speed of light. But momentum is symmetric.

1e18\_ion\_on\_LHP

A screenshot of a computer

Description automatically generated

Electrons spawned outside the right boundary of the ionisation chamber. Still 0 thrust generated.