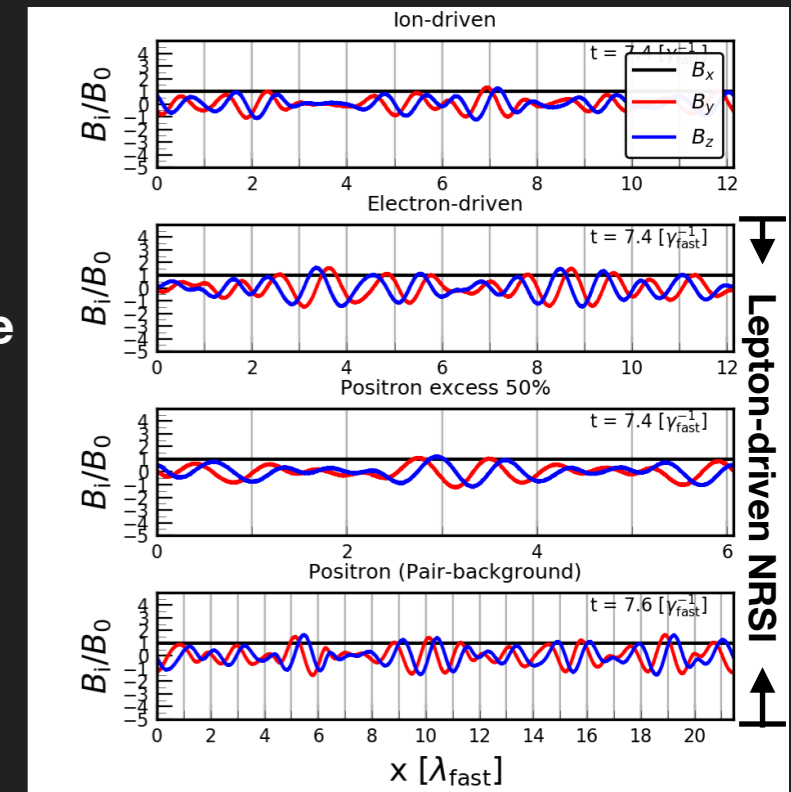


Lepton-driven Non-Resonant Streaming Instability

- Lepton driven instabilities are expected in several astrophysical environments, e.g., quasi-perpendicular shocks, around pulsar wind nebulae, and electron strahl in the solar wind.
- Ongoing effort to study non-resonant streaming instability (NRSI) in the laboratory using energetic electrons.

Performed fully kinetic simulations to study the lepton-driven NRSI for different charge/mass, mixed compositions of cosmic rays (CRs), and in different background plasma (electron-ion, pair plasma).



- When the momentum flux of the CR beam \gg the magnetic pressure, the NRSI can grow faster than resonant instability, regardless of the composition of CRs and background plasma.
- Linear growth depends on the net current of the CR beam.
- Structure of the growing fields depends on the charge of the driving beam
- Final magnetic field scales with CR momentum flux in the plasma frame; $\delta B/B_0 \gtrsim 1$ can be achieved.

Lepton-driven NRSI can increase the scattering rate of CRs and self-confine them near the sources

Gupta, Caprioli, Haggerty (arXiv:2106.07672)