A neutral particle analyzer for fast ion physics studies in LTX-β

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A neutral particle analyzer and neutral beam injector will test confinement and stability limits in LTX-β's low-recycling environment

Research Goals

Neutral beam

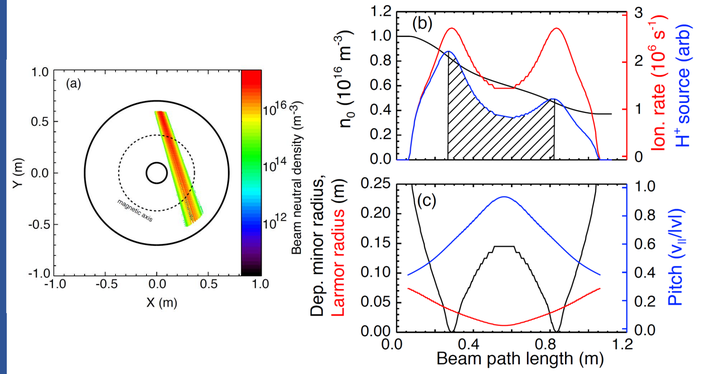
- A 17keV neutral beam has recently been installed on LTX-β, where study of confinement times as well as auxiliary heating and fueling of plasmas is a priority
- Initial modeling predicts a core localized population on passing orbits and plasma beta approaching 20-30% suggesting NBI could play strong role in shaping plasma parameters
- Large fast ion population is likely to drive magnetic instabilities, either Alfvenic eigenmodes which reside in gap in Alfven continuum, or continuum energetic particle modes which occur when particle drive exceeds continuum damping effects.
- NB fast ions will allow study of interaction between ions and associated instabilities, particularly transport of fast ions while also probing mode structure, damping on background plasma, and nonlinear dynamics

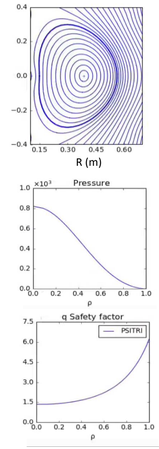
Neutral Particle Analyzer

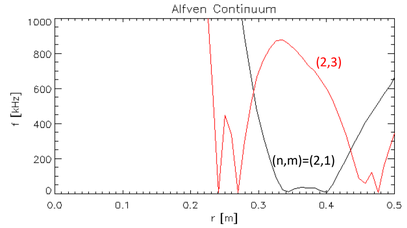
- A NPA will provide beam (and bulk) ion energy distribution evolution via **E** or **B** field energy separation (mass separation is not needed for single species plasmas)
- Monitoring fast ion energy distribution surrounding Alfvenic mode activity is key for measuring fast ion loss particularly when the fusion neutron flux cannot be used as a diagnostic

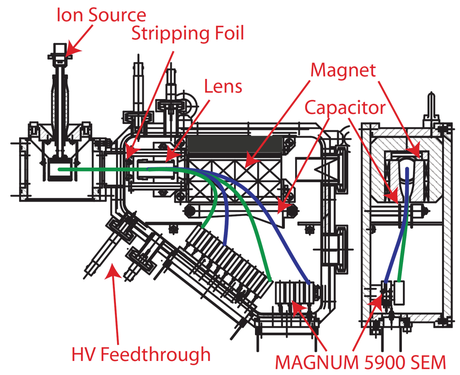
TRANSP modeling

- NUBEAM modeling is needed to predict fast ion characteristics (density, energy desposition, etc)
- Fast ion orbit topologies are key to understanding fast ion population growth and resonance with Alfvenic instabilities.









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LTX-β