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- Confinement in standard RFP plasma is poor due to magnetic fluctuation induced transport.
  - **Question:** How do the magnetic fluctuations affect the confinement of energetic ions?
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  - Fast CX neutral flux (a.u.) from plasma for 10 keV and 20 keV injection.

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<td>10 keV</td>
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- **Expected stochastic losses** = E\(^{1/2}\) - not observed:
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- We tried to measure fast ion confinement in improved plasmas (smaller fluctuations) but CX flux was too low to detect.

- We also measured the rate of fast ion energy loss and found it to be consistent with the classical i-e slow down time.

- **What is the fast ion loss mechanism?**
  - Stochastic diffusion?
  - Charge exchange?
  - Direct drift orbit losses?

**Goals and Directions**

- Effect of stochasticity on fast ion confinement.
- Role of background neutrals and CX losses.
- Macroscopic effect of NBI - plasma heating and induced rotation.
- Fast ions energy losses.
- Numerical simulations - see poster by Ben Hudson.

**Possible Macroscopic Effects of Injection**

- **Heating**
  - Fast ion energy content - 1 kJ
  - Plasma thermal energy content - from 3 kJ to 10 kJ

- **Plasma rotation**
  - Rate of fast ion toroidal momentum injection - 1 kg m/s
  - Rate of plasma momentum change during sawtooth - 10 kg m/s\(^2\)

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**New Tool**

60A/25keV/1ms Neutral Beam Injector

- **Beam Testing Preliminary Results**
  - Designed Parameters:
    - \(I_{beam} = 60\) A
    - \(U_{beam} = 25\) kV
    - Duration = 1.2 ms

- **Schematic of experiment**

  - \(a = 0.5\) m
  - \(R = 1.3\) m
  - \(V = 7.4\) m\(^3\)

- **Diagnostics:**
  - Fast ion confinement and plasma ion heating - NPAs, CHERS
  - Electron heating - Thomson Scattering
  - Plasma rotation - magnetics and Doppler spectrometry