PAC Action Items (Fast Ions, Losses, etc.)

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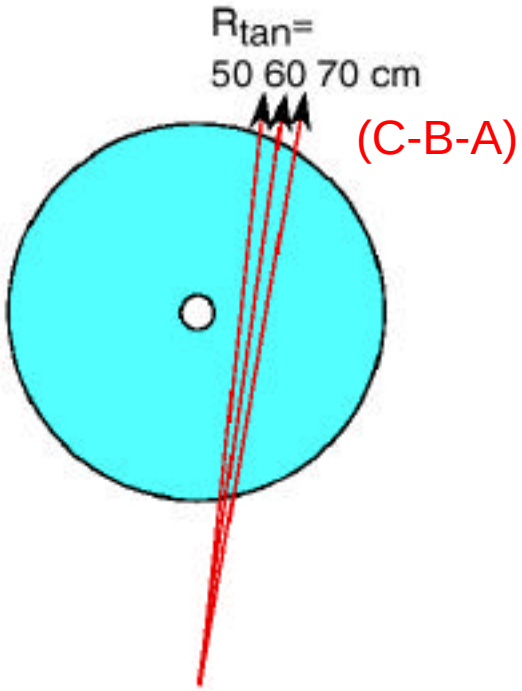
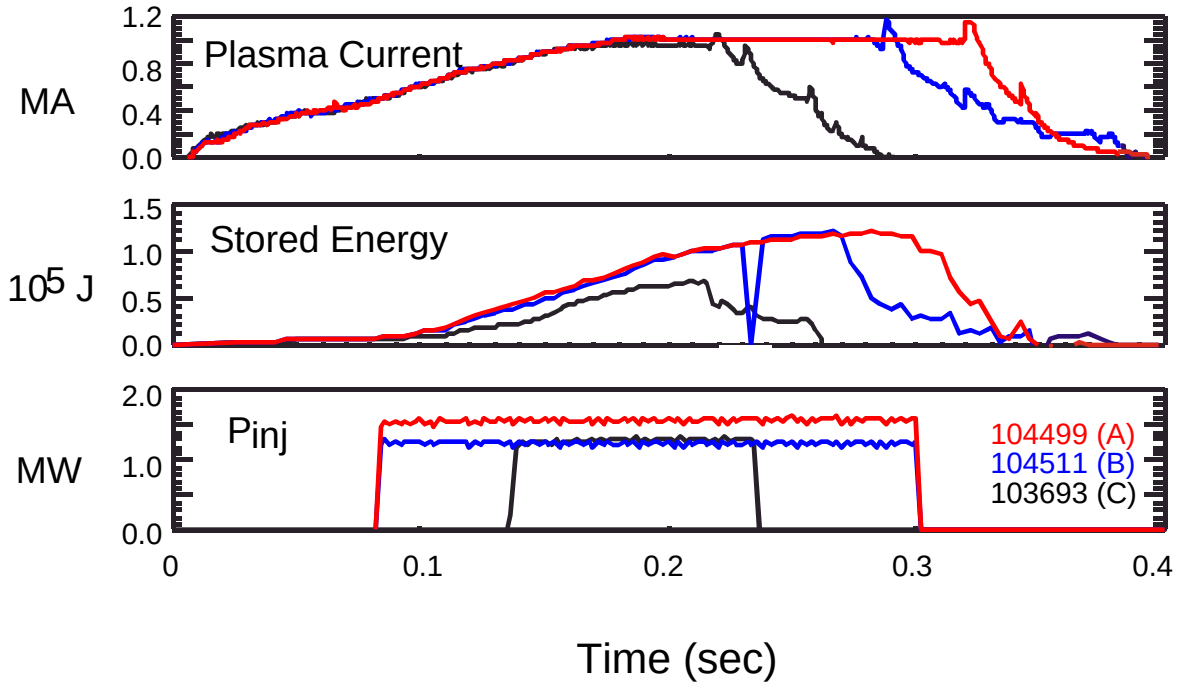
Outline

Fast ion losses can be significant on NSTX

- *Assess experimental results*
  - *Study heating efficiency as a function of beam source*
  - *Neutrons, fast ion loss probes*
  - *Base loss estimates on measured profiles*
    - *TRANSP (GC w/ FLR)*
- *Fast ion loss in large outer gap equilibrium*
  - *q_0>>1 (optimized high-β case)*

Heating Efficiency Comparison

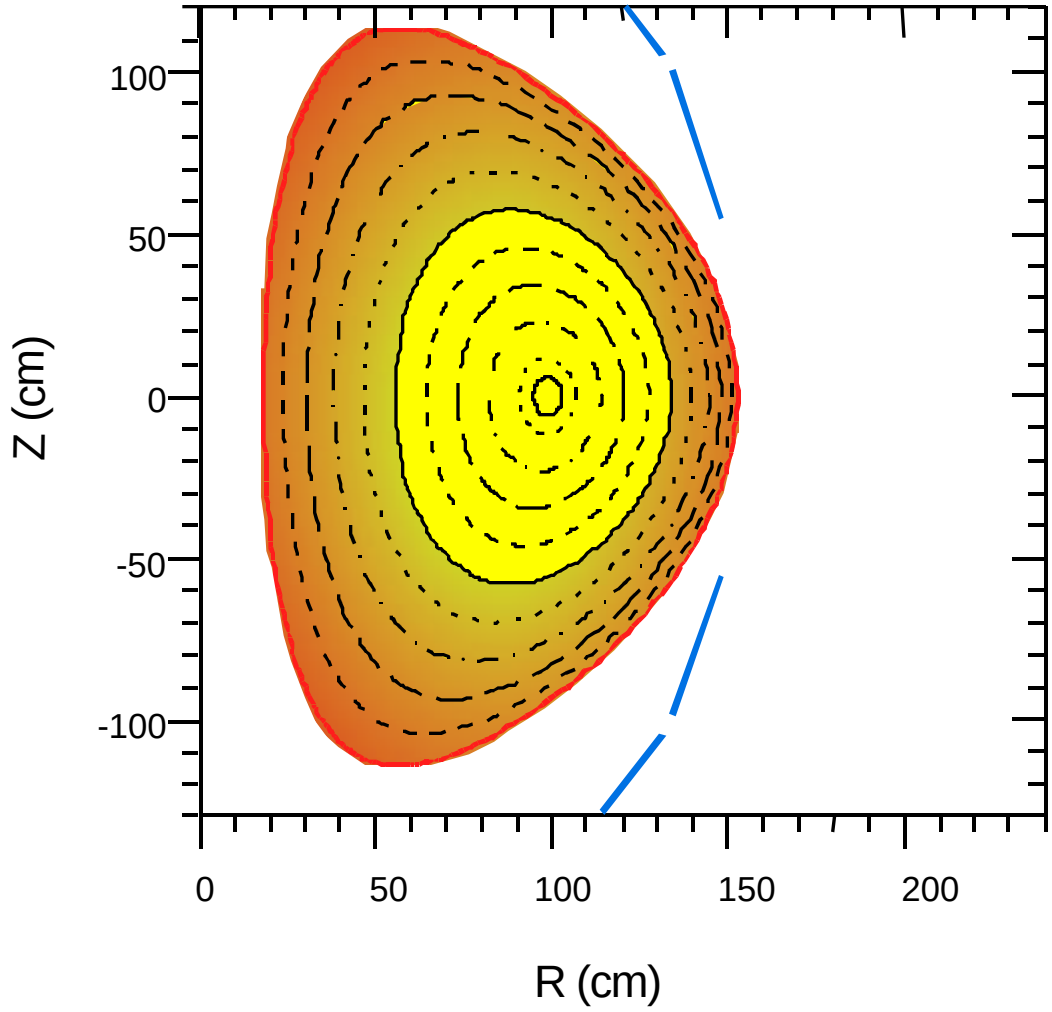




NSTX Equilibrium

NSTX

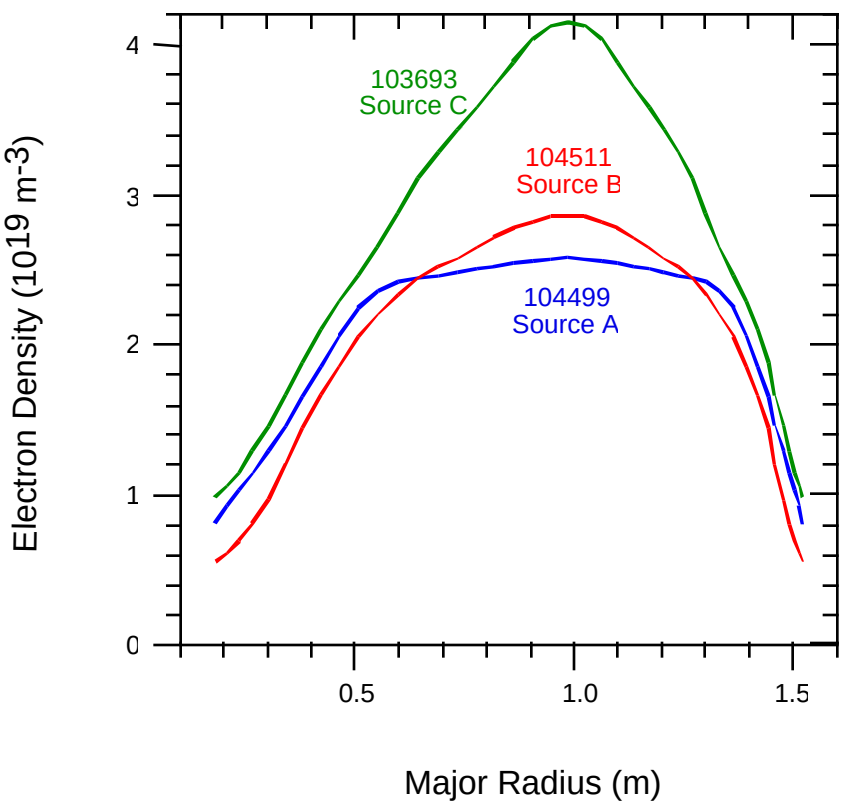
I_p=1 MA
B_T=0.45 T
κ=1.8
P_{inj}=1.2-1.6 MW

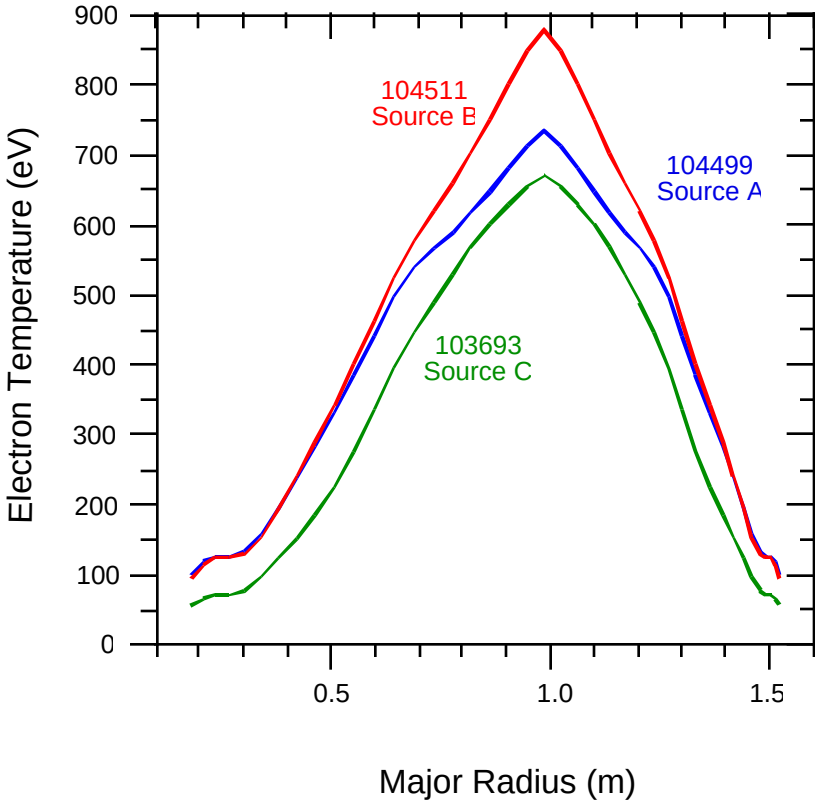


Profiles used in TRANSP Beam Ion Loss Calculation

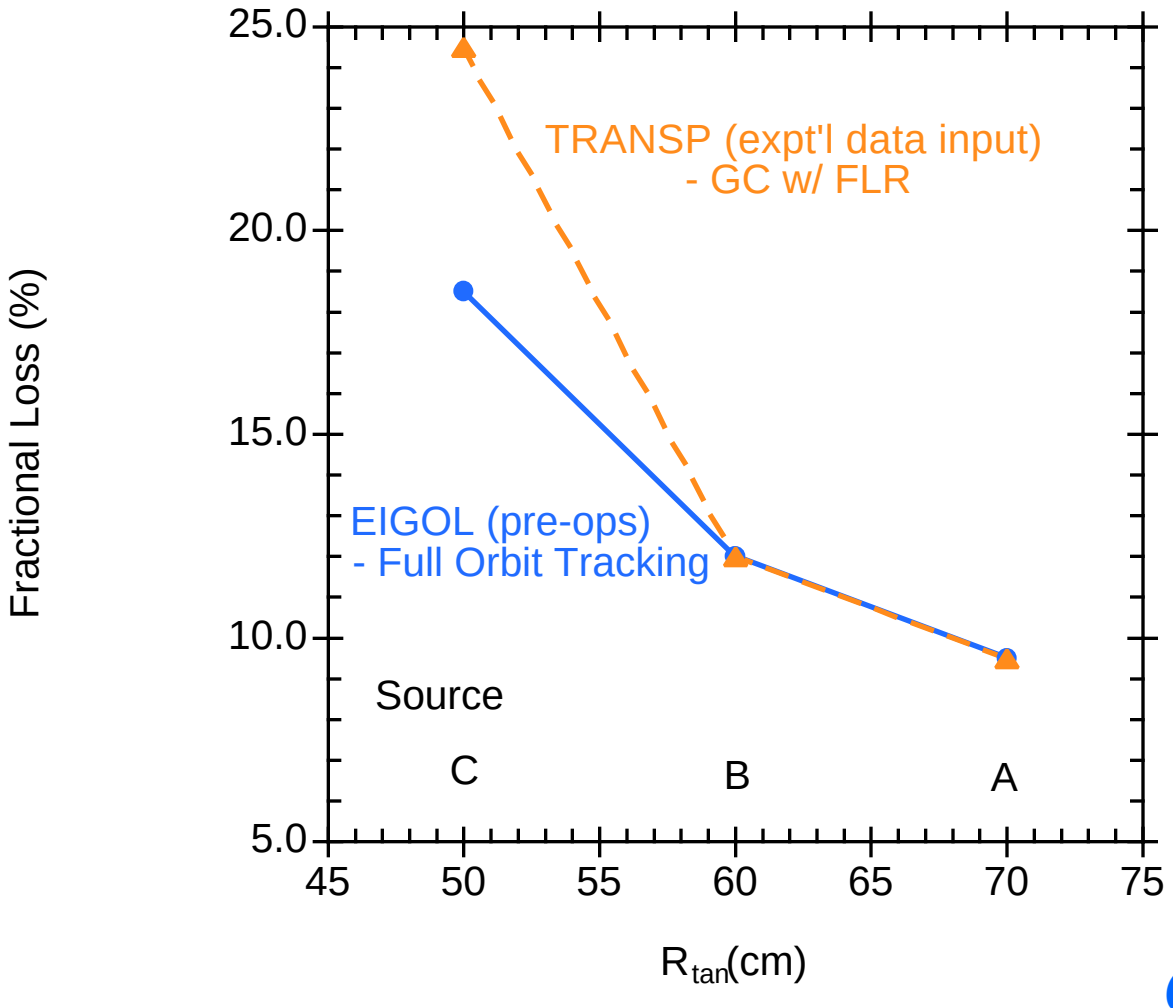
NSTX

Multi-Point Thomson Scattering



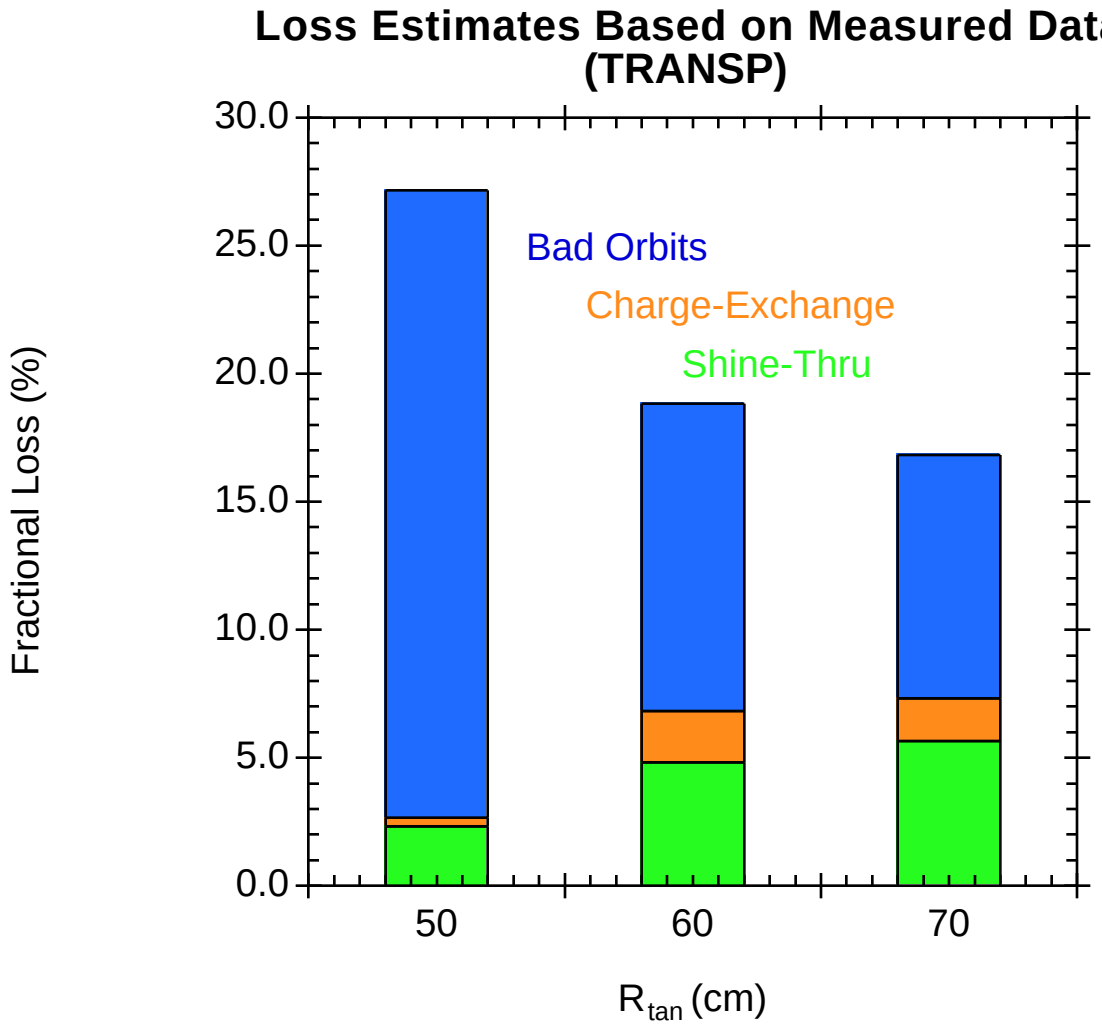


Fractional Loss



(D. Darrow, S. Kaye)

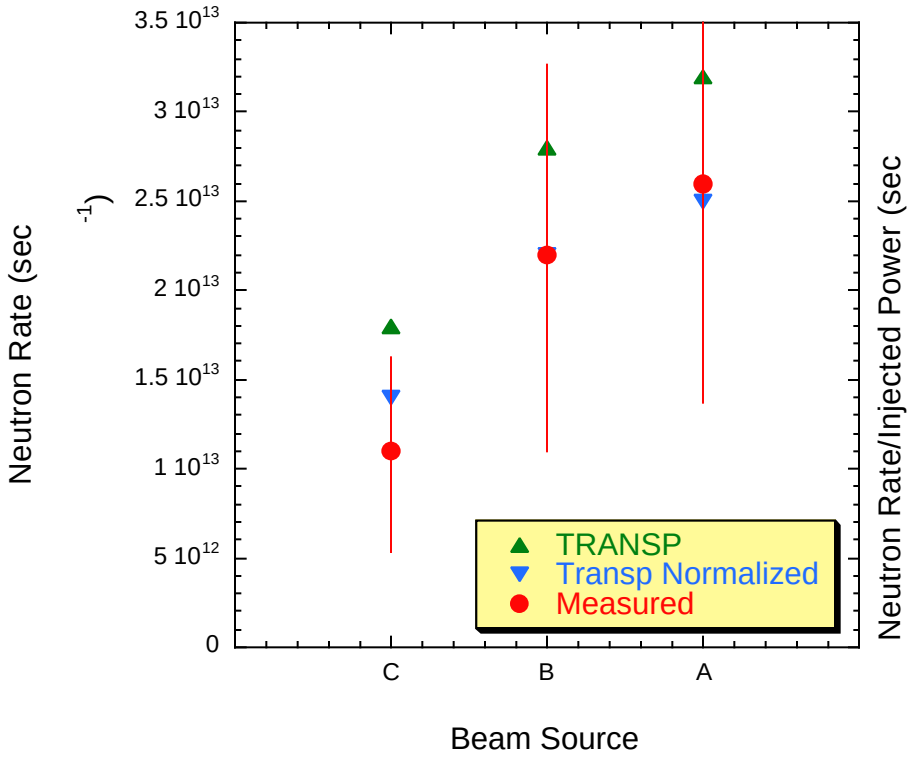
Loss Channels



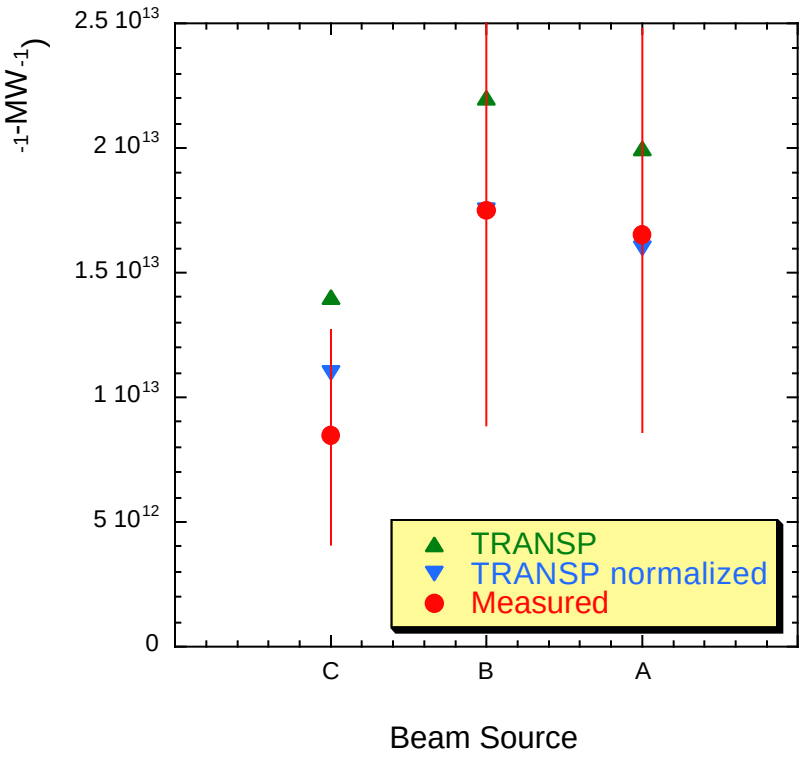
Measured and Calculated Neutron Rates Consistent

NSTX

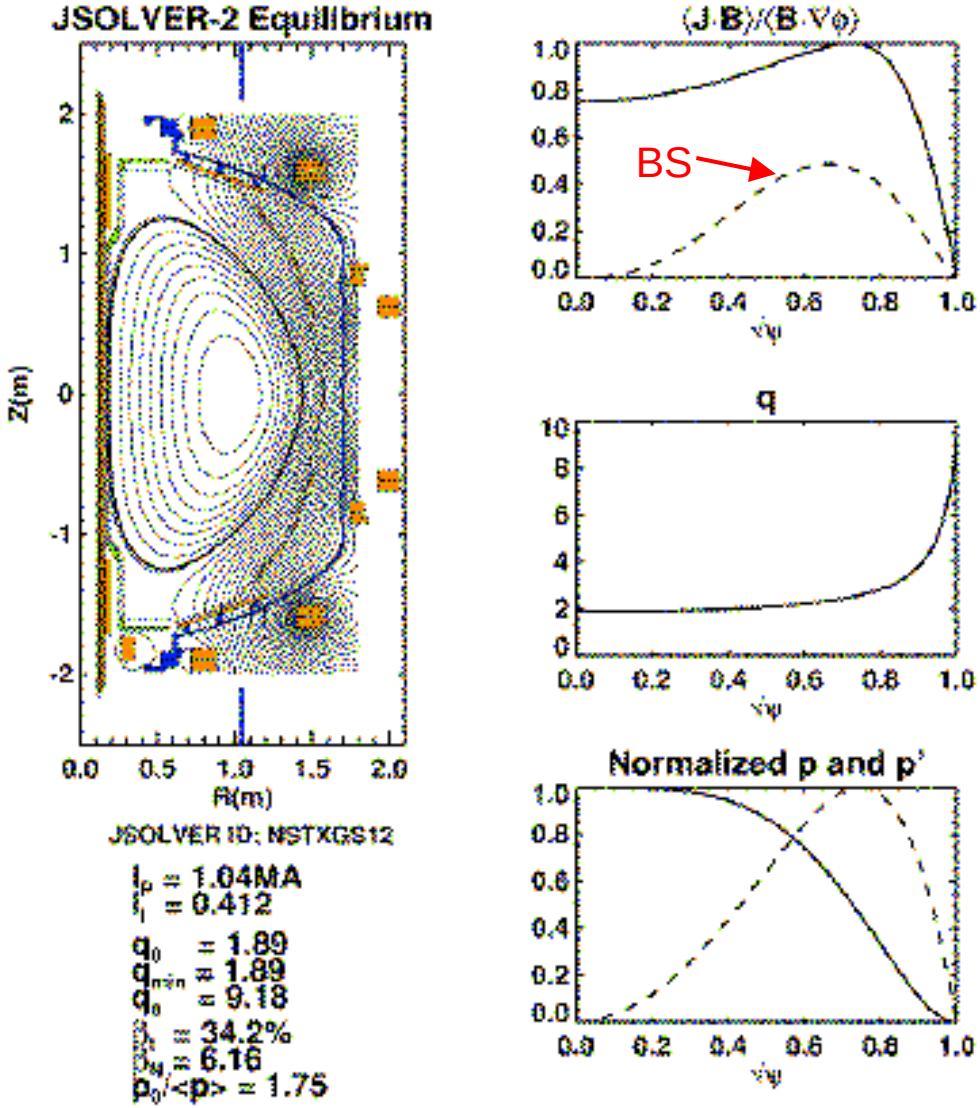
Neutron Rates



Neutron Rates/P_{inj}



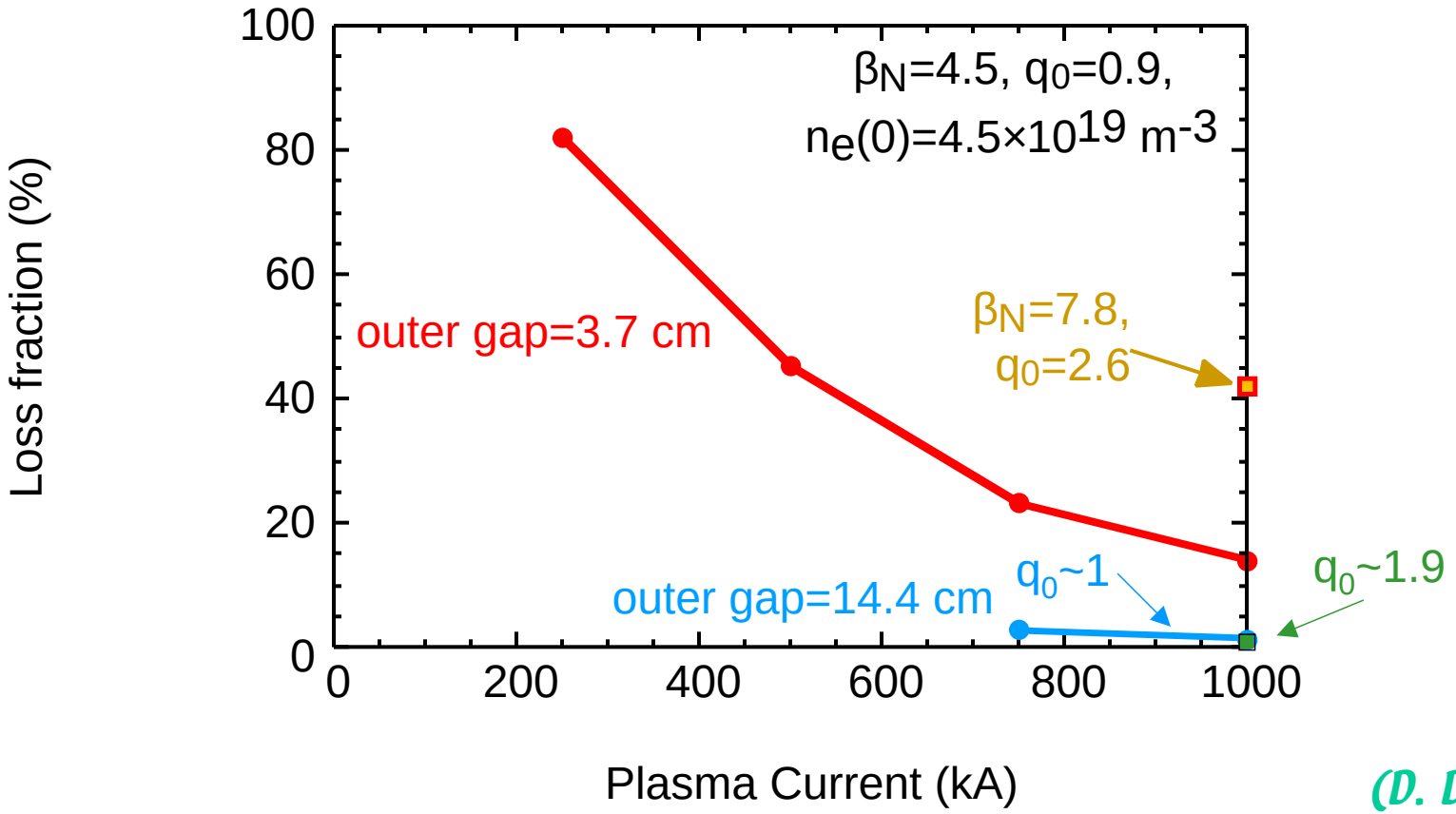
Stability-optimized NSTX equilibrium with 14 cm outboard gap



- β_t = 34%, β_N=6.2
- f_p = 45%
- Stable to ballooning and n=1-3 kink modes and with NSTX passive structure

(J. Menard)

Large Outer Gap Case Leads to Low Bad Orbit Loss for all q_0



(D. Darrow)

Need to study effect of charge-exchange loss
- Neutral density estimates required