ENERGETIC PARTICLE TRANSPORT CALCULATIONS FOR NCSX CONFIGURATION QAS3C10 UPDATE

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Stellarator Group Meeting
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OUTLINE

1) Radial behavior of beam ion loss

2) Collisionless losses

3) Collisional beam ion loss:

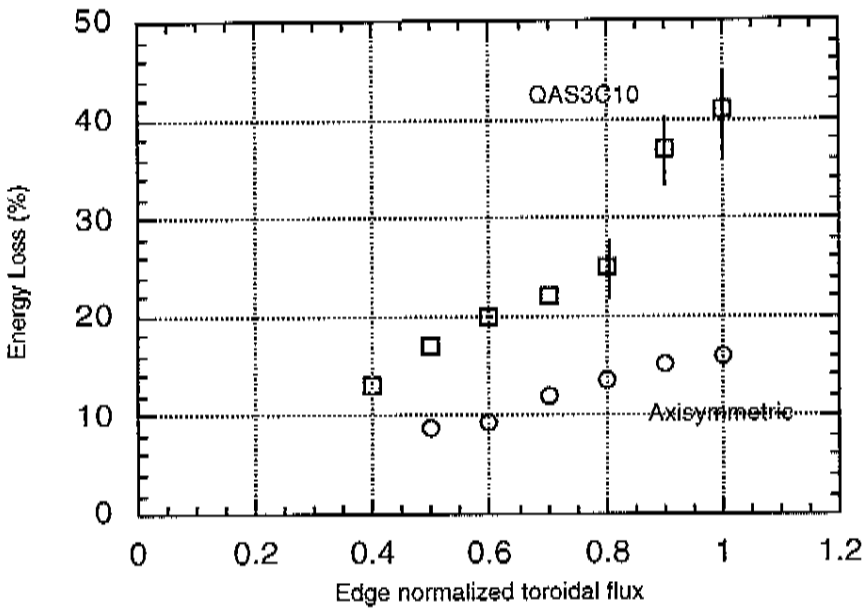
4) Single particle orbits

1)RADIAL LOSS BEHAVIOR OF BEAM IONS

*** Truncate beam deposition profile outside ψ/ψ_{edge} = 0.9, 0.8, etc**

- Normalize losses by integrated deposition power within ψ
- Find higher losses than tokamak at all radii,
- Improved statistics needed

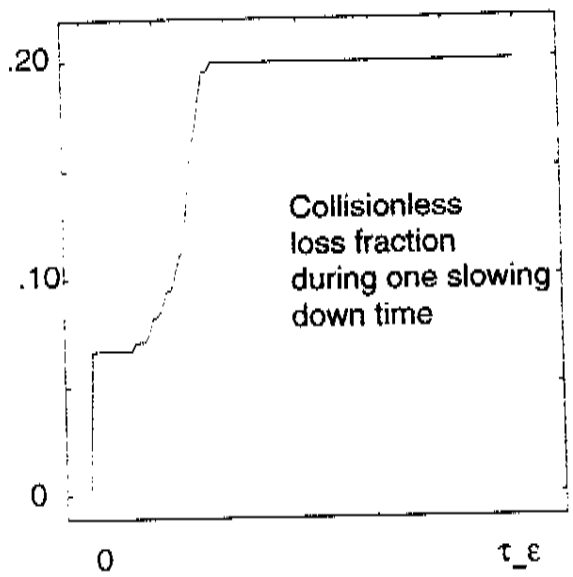
Beam ion losses increase linearly with increasing size of deposition region



2) COLLISIONLESS LOSS

*** Collisionless loss time dependence unlike tokamak**
Numerical diffusion being checked

- Stellarator collisionless particle loss fraction

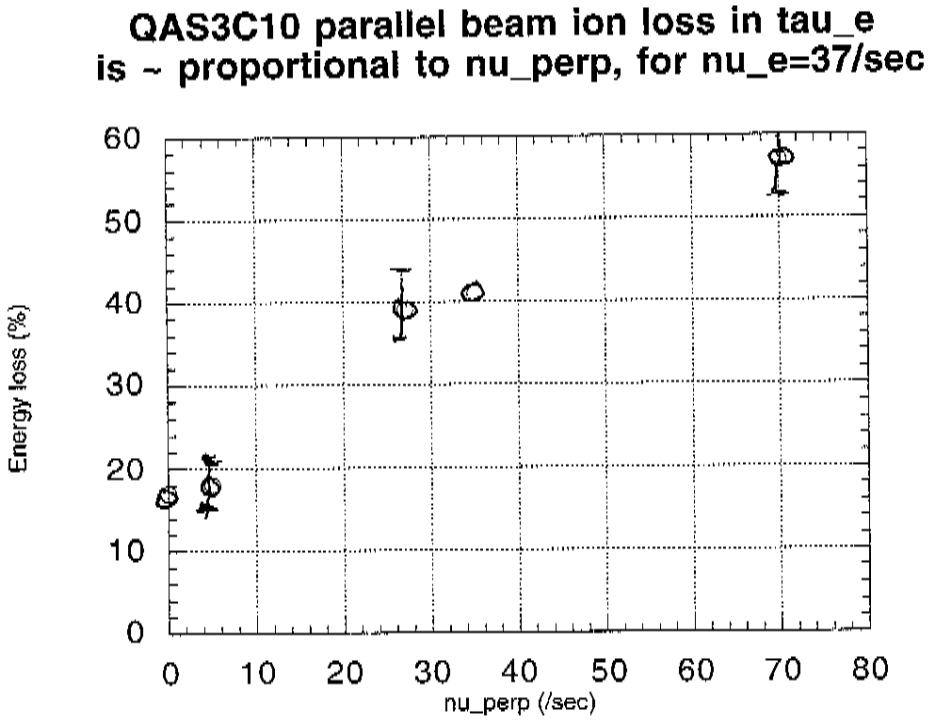


* Axisymmetric collisionless particle orbits show no losses
- With TF ripple in tokamaks:
  no collisionless loss time dependence on this scale

* New behavior
- Ripple trapping in helical wells
- Ion orbits following island perturbed field lines
- Long time scale stochastic orbits

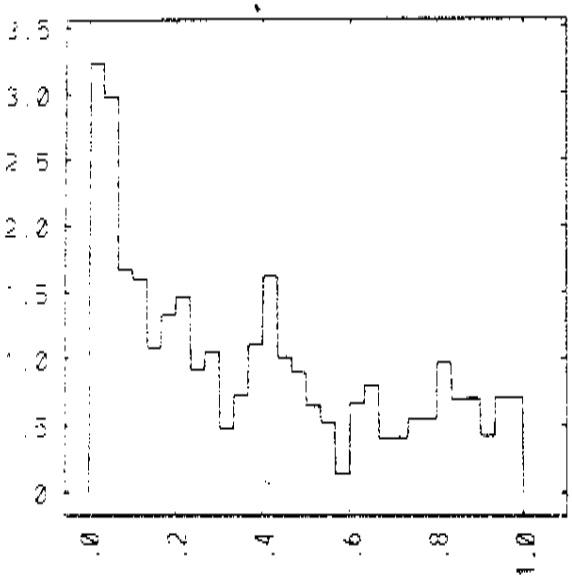
3) COLLISIONAL BEAM ION LOSS:

A) Linear $\nu_\perp$ scaling of power losses; prompt losses

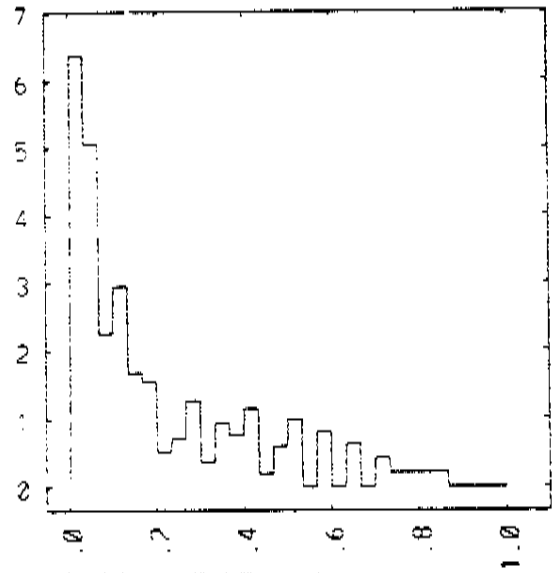


B) Stellarator beam ion losses nu_perp(0) = 35/sec localized in domain outside $\psi = 0.5\ \psi_{edge}$

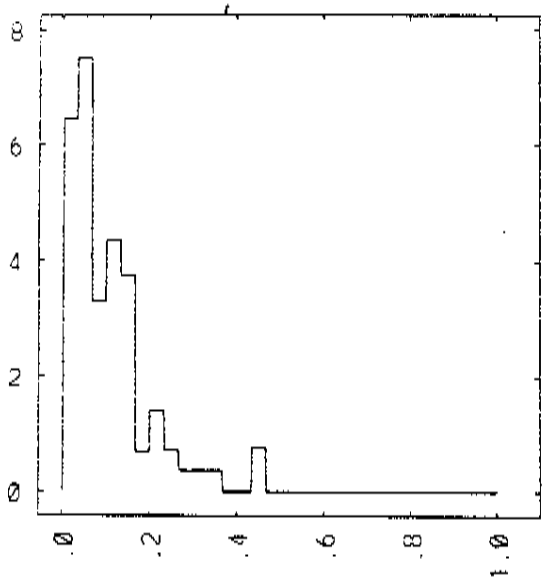
- initial deposition profile



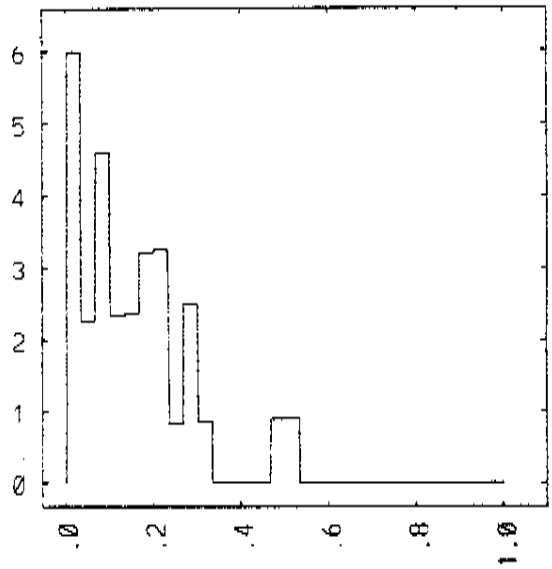
final tokamak density profile



- final density profiles show sharp edge at $\psi = .5$

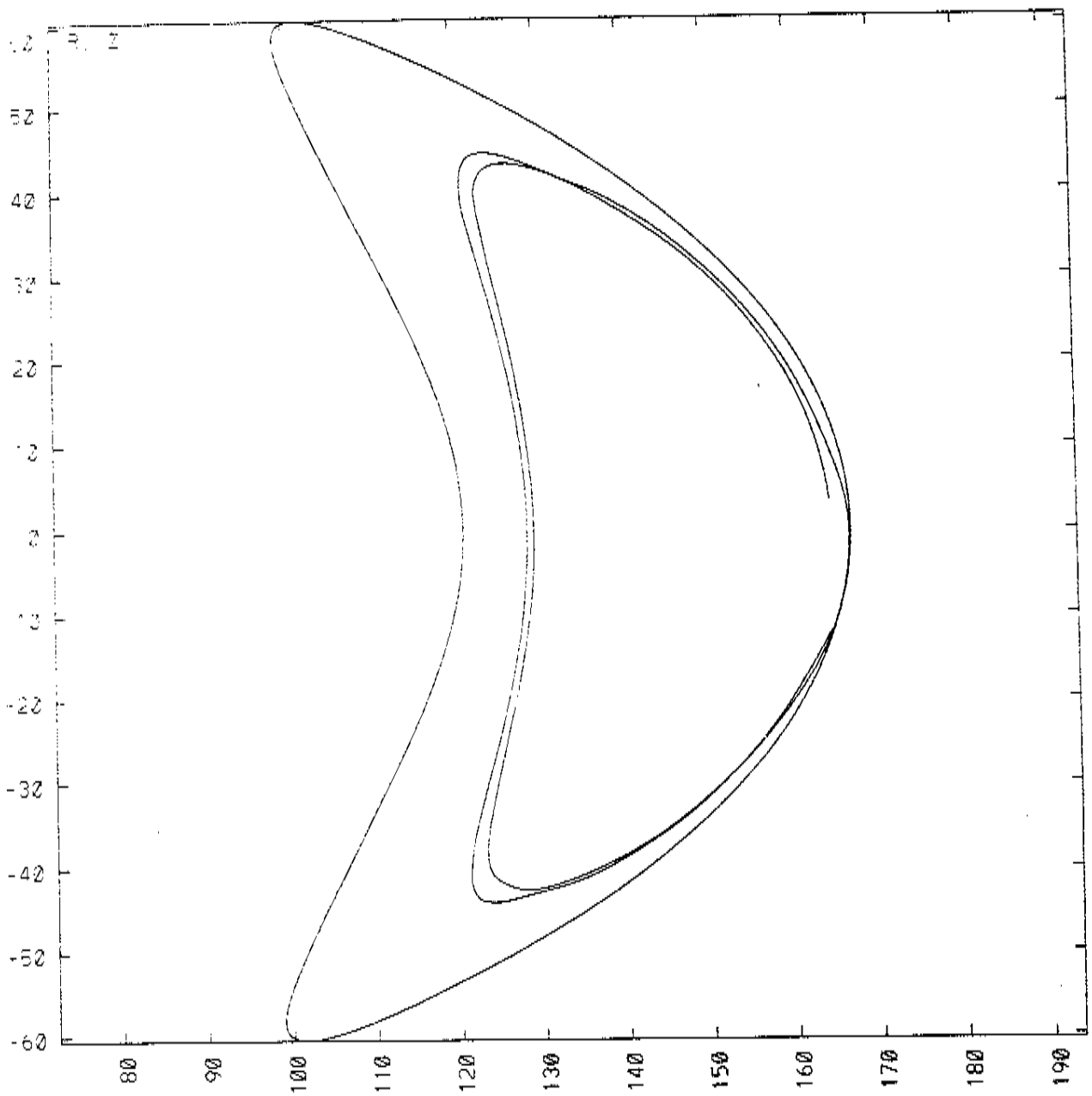


- same edge, reduction at center for doubled nu_perp



4) SINGLE PARTICLE ORBITS:

Ripple Trapped Ion In Helical Well?, Orbiting Island?



SUMMARY

1) Radial behavior of beam ion loss

High losses outside r/a = .7

2) Collisionless loss unlike tokamak, time dependence

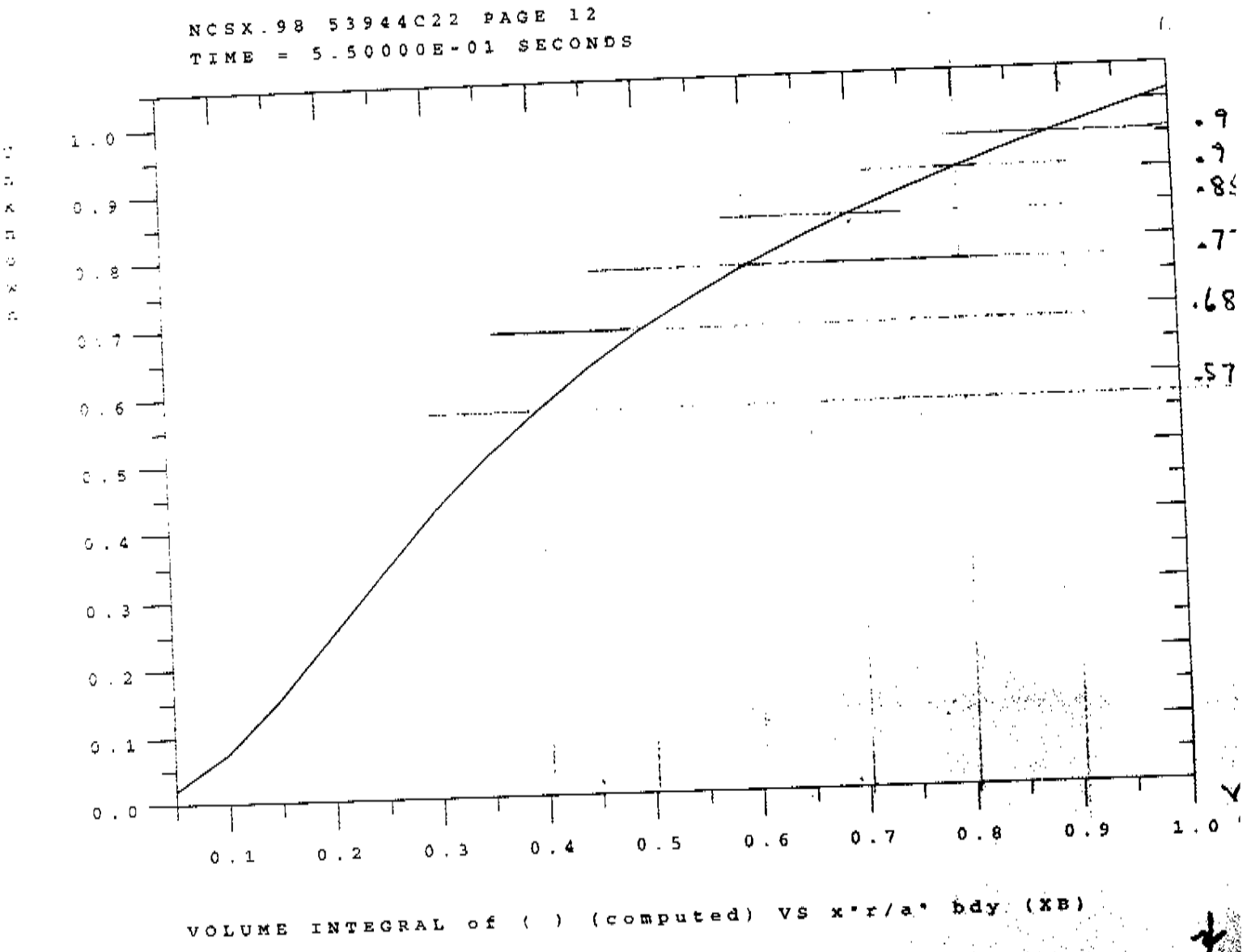
3) Collisional beam ion loss:

- linear nuperp scaling of power losses; prompt loss
- final density profiles show high losses outside r/a=.7

4) Single particle orbits unlike tokamak

- Ripple trapped ions following helical well or island?
- Long time scale lost orbits in absence of collisions
  - Stochastic loss or numerical diffusion?

Volume Integrated Beam Deposition.



.7 .9