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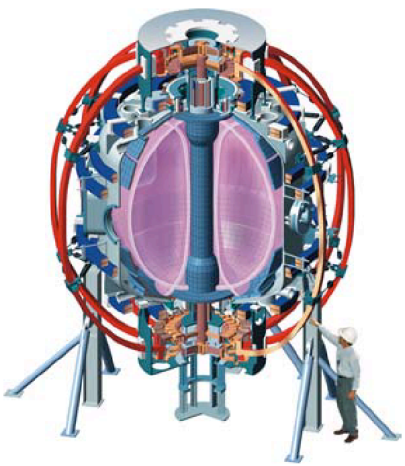
Spatial Localization of MHD-induced Energetic Ion Loss in NSTX

S. S. Medley

Princeton Plasma Physics Laboratory, PO Box 451, Princeton, NJ 08543 USA



XP-504
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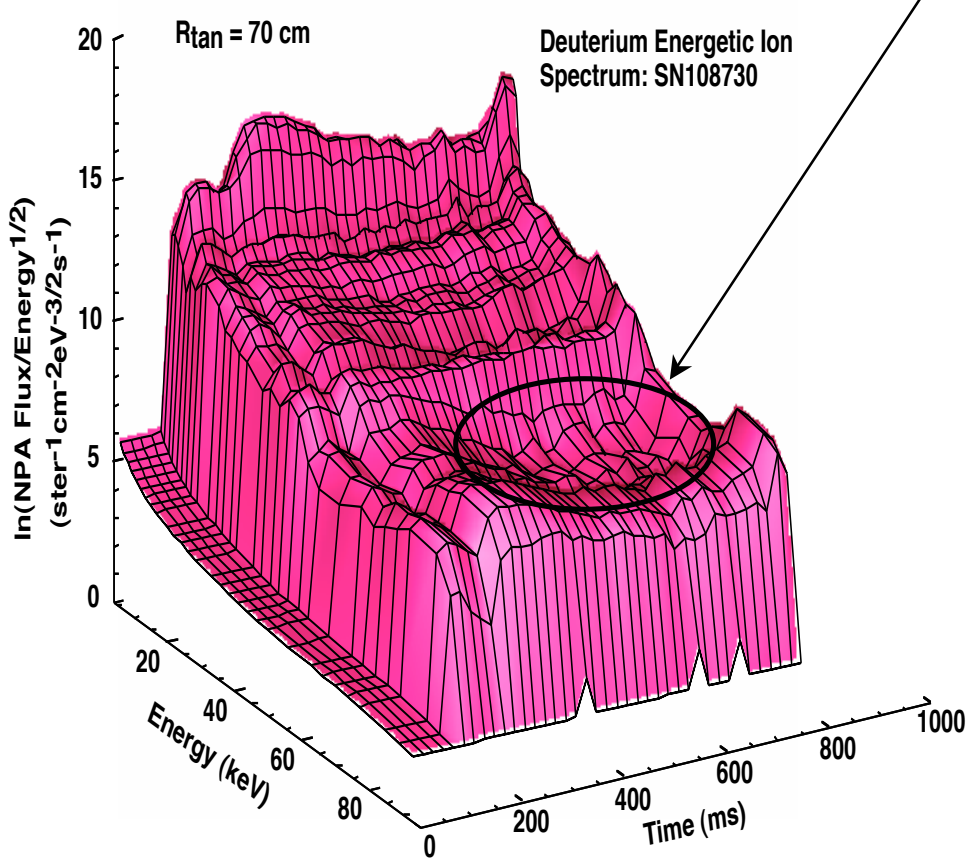
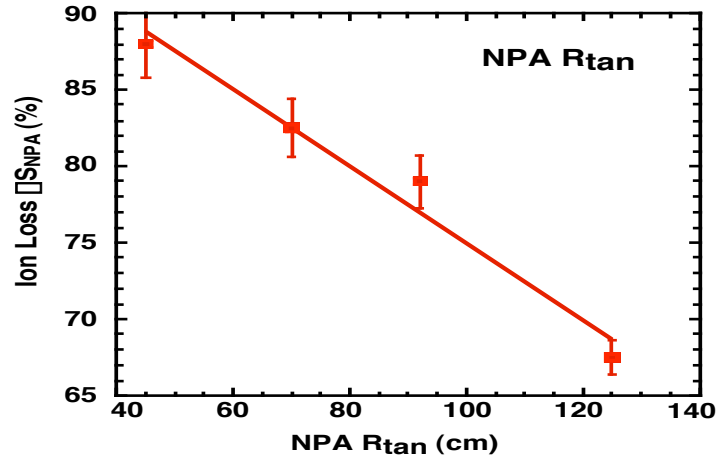
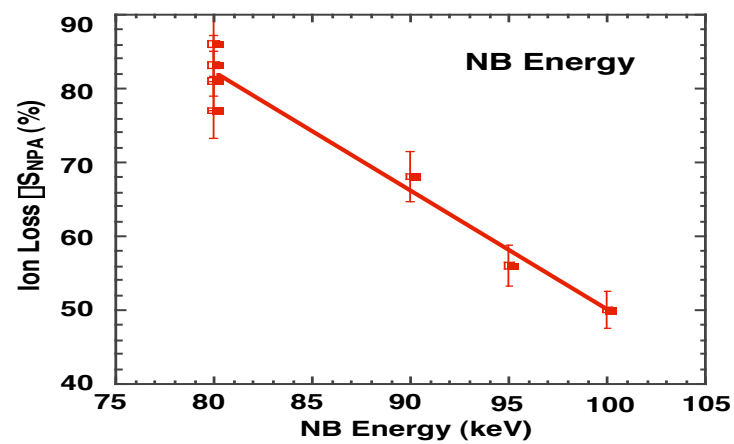
Illustration of MHD-induced Ion Loss during H-mode

B_T = 4.8 kG, I_P = 0.8 MA, Source A & B @ 90 keV, Low MCP Bias

- **Following H-Mode onset at 230 ms, the NPA spectra show significant loss of energetic ions *only for $E>E_b/2$*.**



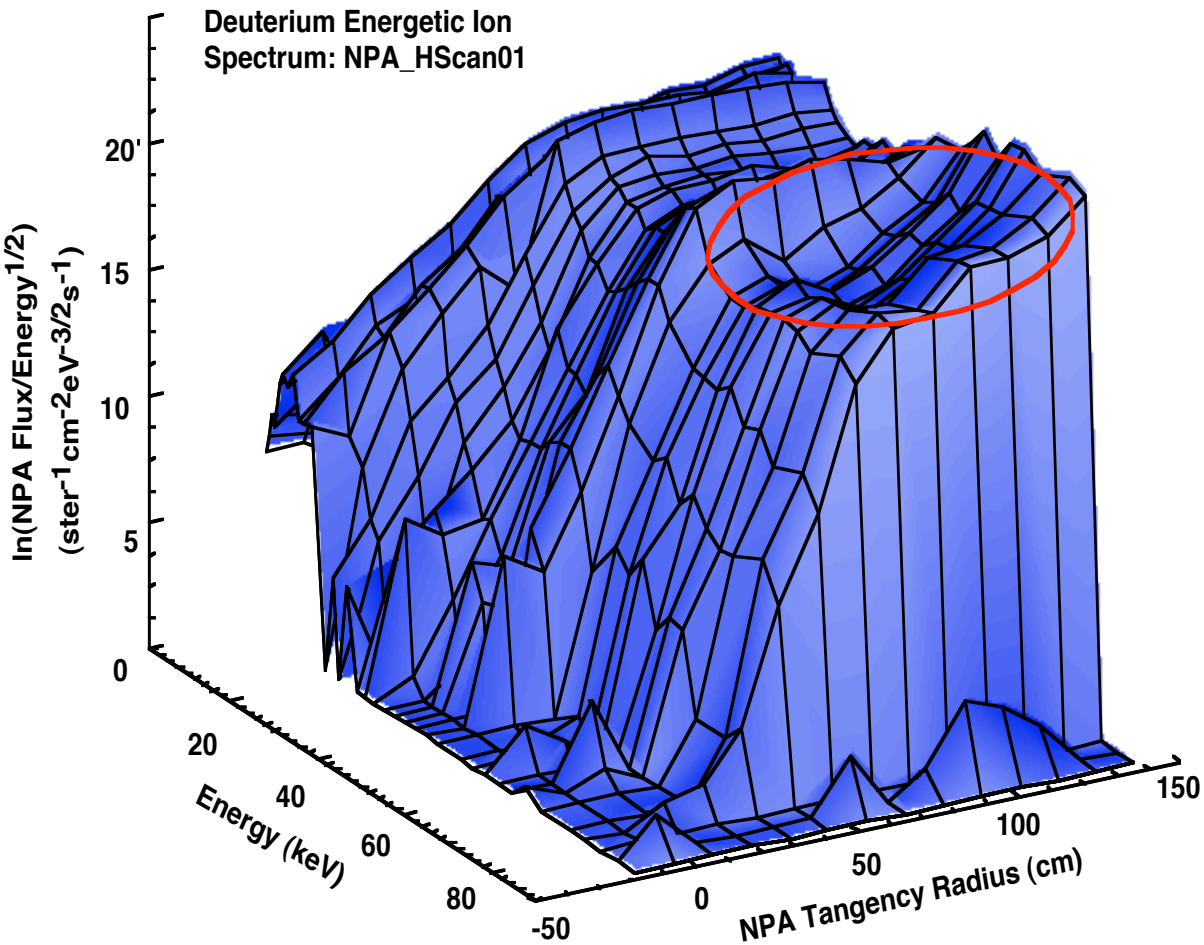




- **Loss observed to decrease with increasing R_{tan} and NB energy.**

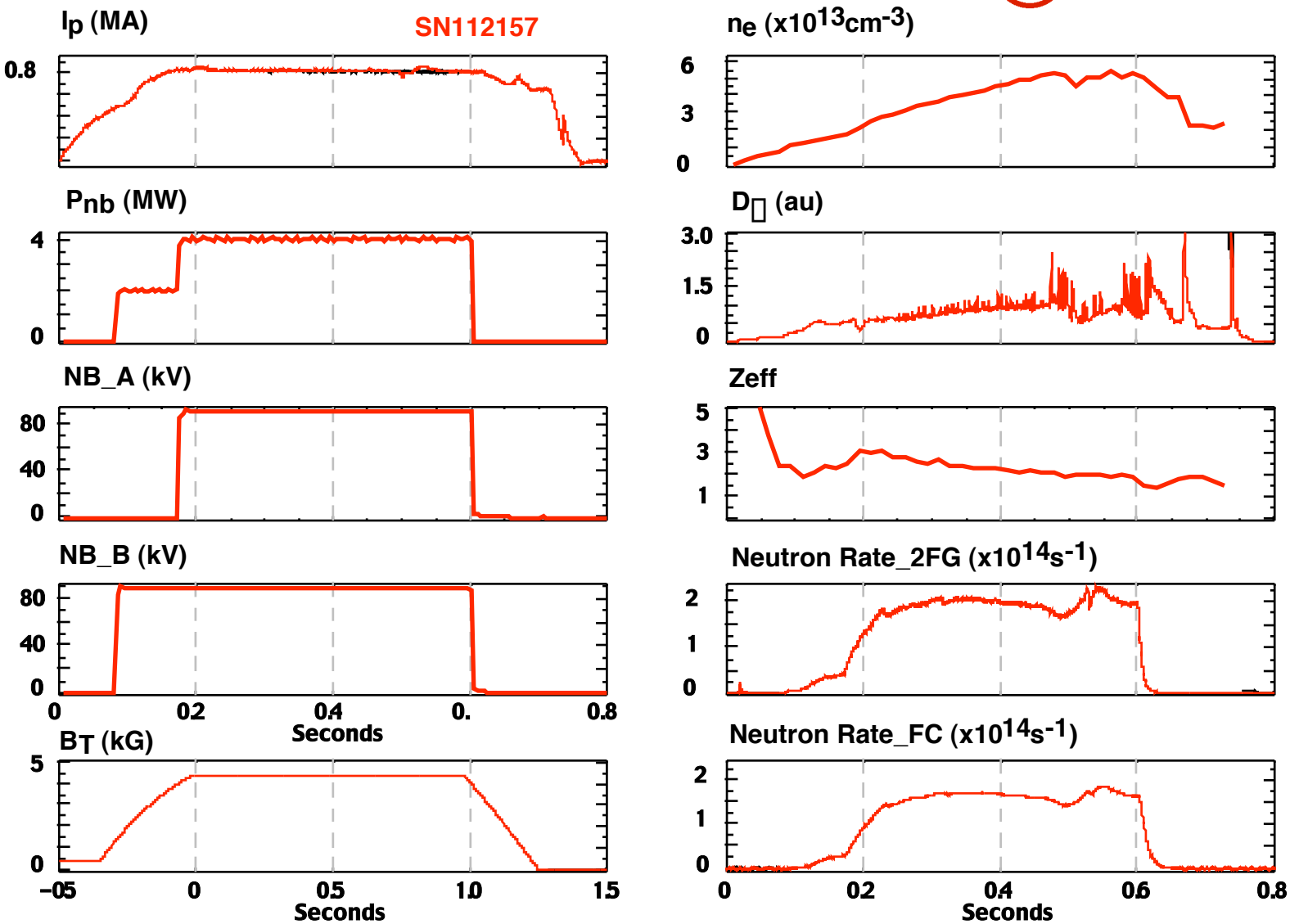
Medley, et al. Nucl. Fusion 44 (2004) 1158

Preliminary Evidence for Spatial Localization of MHD-induced Energetic Ion Loss



- Scan shot range: 111478 - 92 with sources A & B @ 90 keV.
- Mostly ratty short discharges with IRE activity.
- No CHERS data.
- Energetic ion loss in the region $E > E_b/2$ appears to be localized in the spatial range $60 < R_{tan} < 115$cm (encircled region).

XP-504 Candidate Reference Shot



XP-504 Shot Sequence

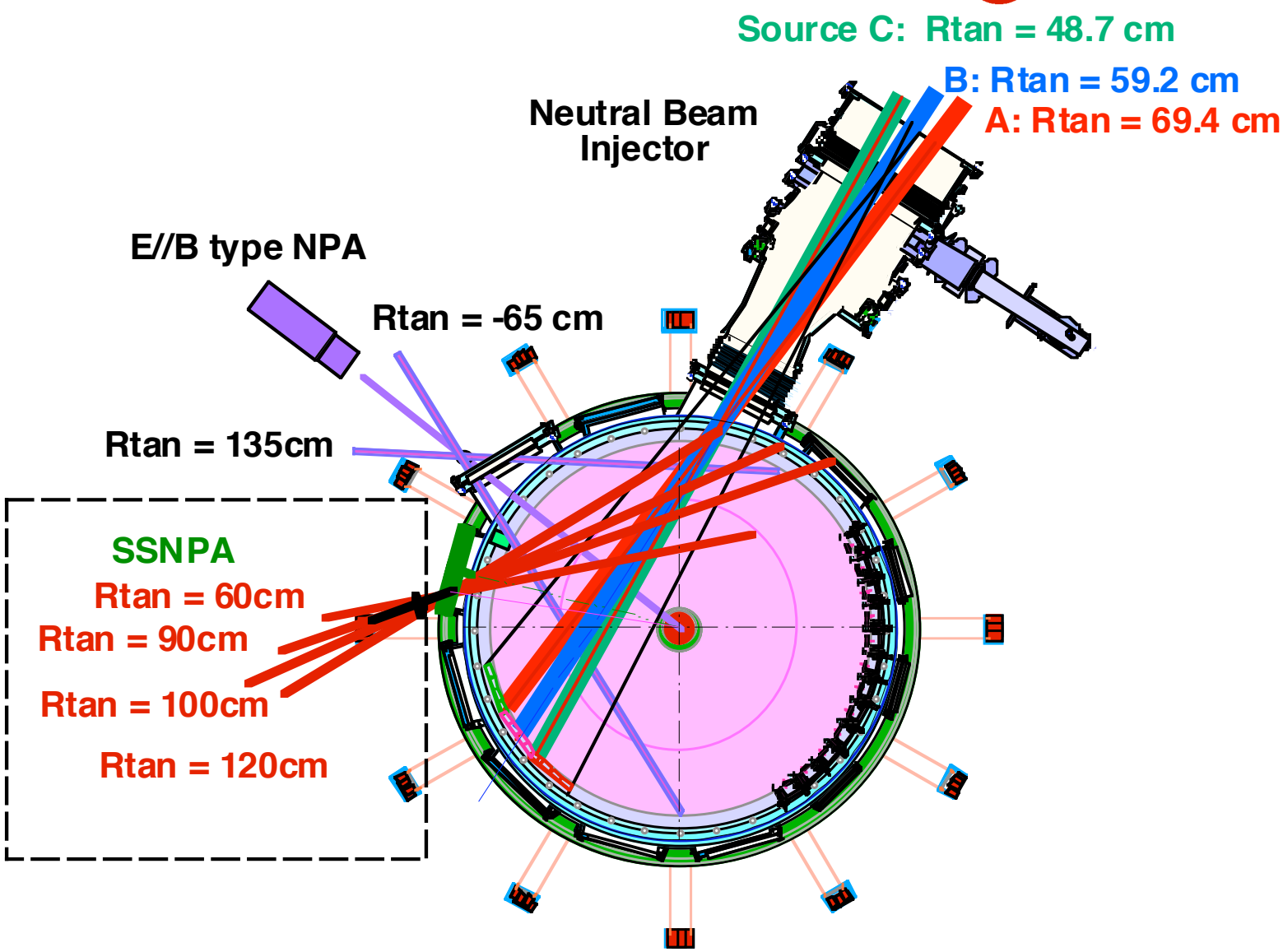
- **Horizontal Scan**

Shot Number	Horizontal Position(cm)	
1	125	❒
2	100	❒
3	75	❒
4	50	❒
5	25	❒
6	0	❒
7	-25	❒
8	-50	❒
9	-75	❒
10	-12.5	❒
11	12.5	❒
12	37.5	❒
13	62.5	❒
14	87.5	❒
15	112.5	❒
16	125	❒

- **Skip small Rtan shots if no loss evident and increase resolution in loss region.**

- **Perform a beam energy scan (60 - 100 keV) at maximum loss region (~ 4 shots)**

XP-504 Summary

- Finalize reference discharge with early H-mode (sources A & B @ 90 keV).
- CHERS, MPTS and magnetics (EFIT) are essential.
- Perform horizontal scan over range -75 < R_{tan}(cm) < 125 (~ 16 shots)
- Scan NB energy in range 60 -100 keV and measure loss at optimum R_{tan}(~4 shots).
- Total shots ~ 20: 1-Day
- Perform TRANSP analysis with spatially localized enhanced fast ion diffusion to mimic MHD-induced loss (Medley) and refine ORBIT modeling of the MHD loss mechanism (Gorelenkov).

Layout of the EllB and Solid State NPAs on NSTX