

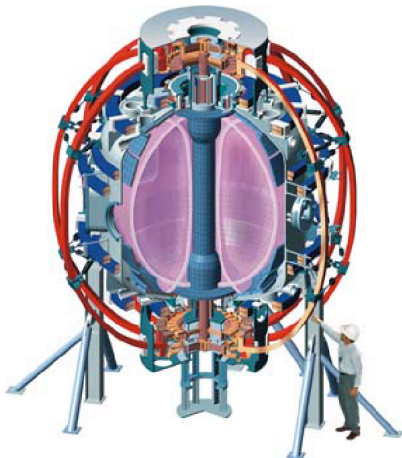
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Spatial Localization of MHD-induced Energetic Ion Loss during H-mode Discharges in NSTX

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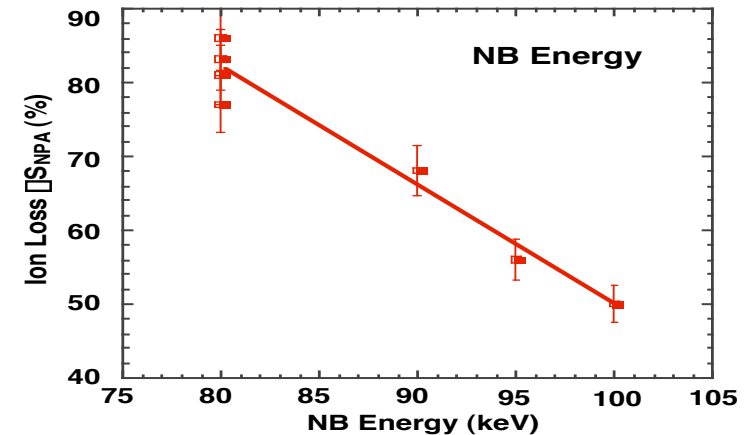
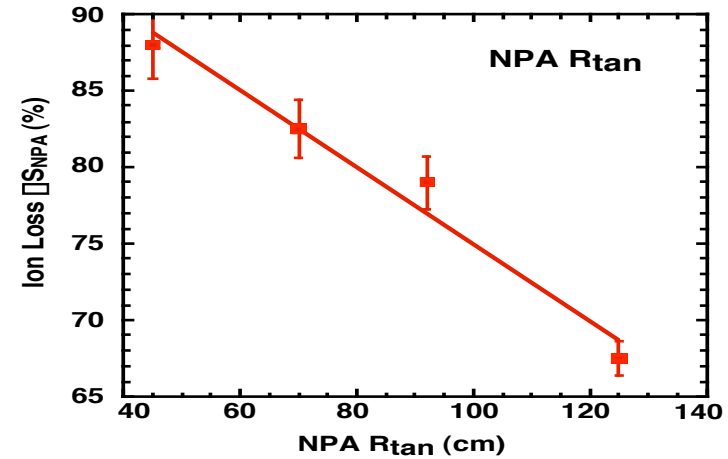
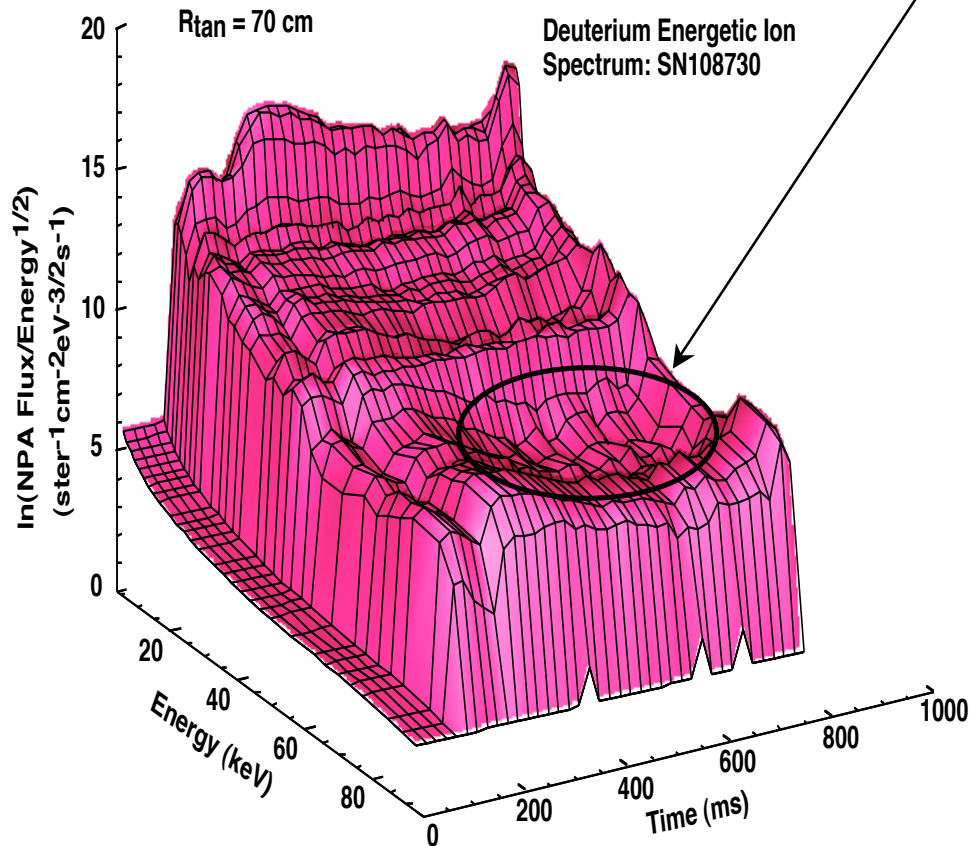
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Illustration of MHD-induced Ion Loss during H-mode

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



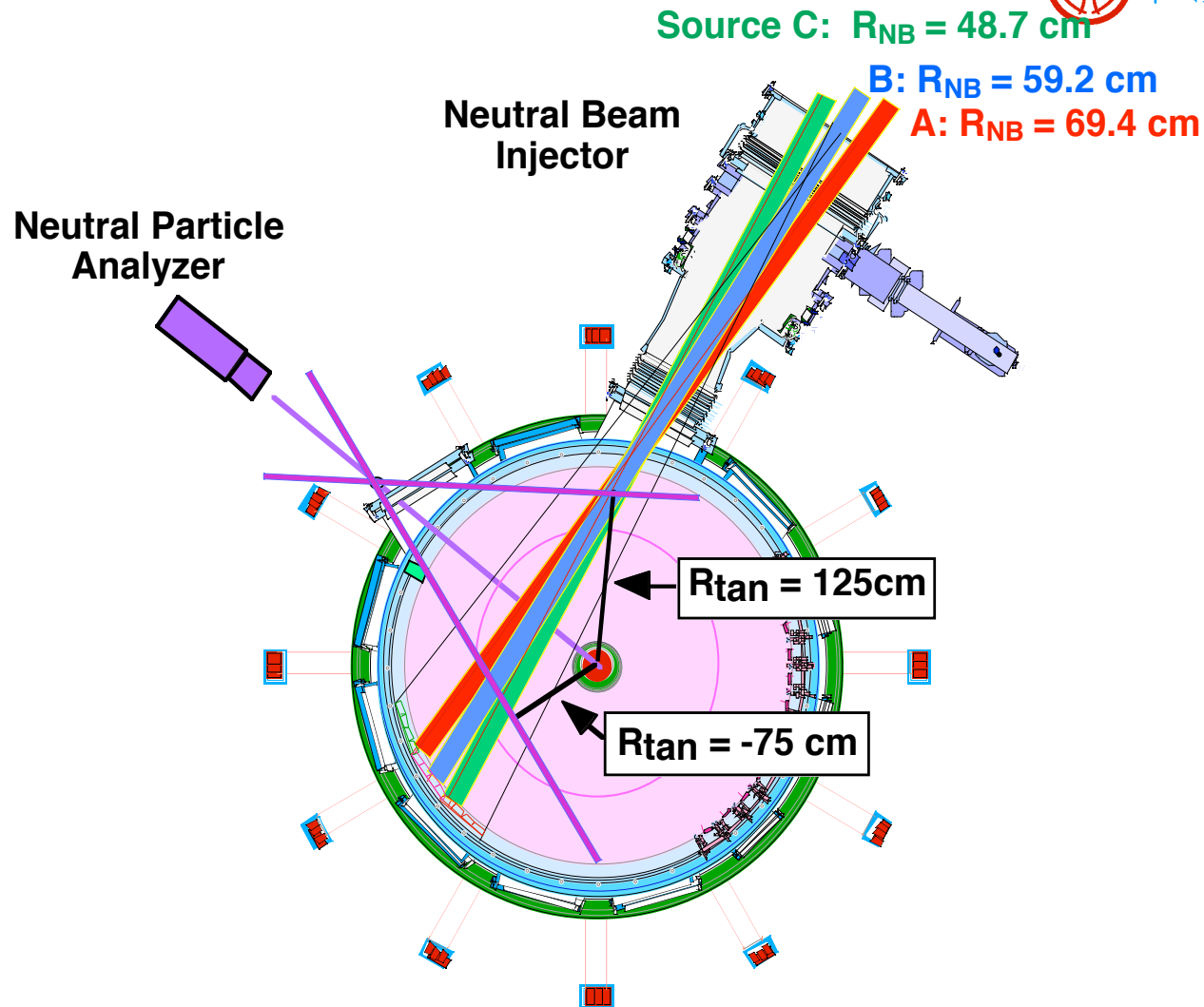
- Following H-Mode onset at 230 ms, the NPA spectra show significant loss of energetic ions *only for $E > E_b/2$* .



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

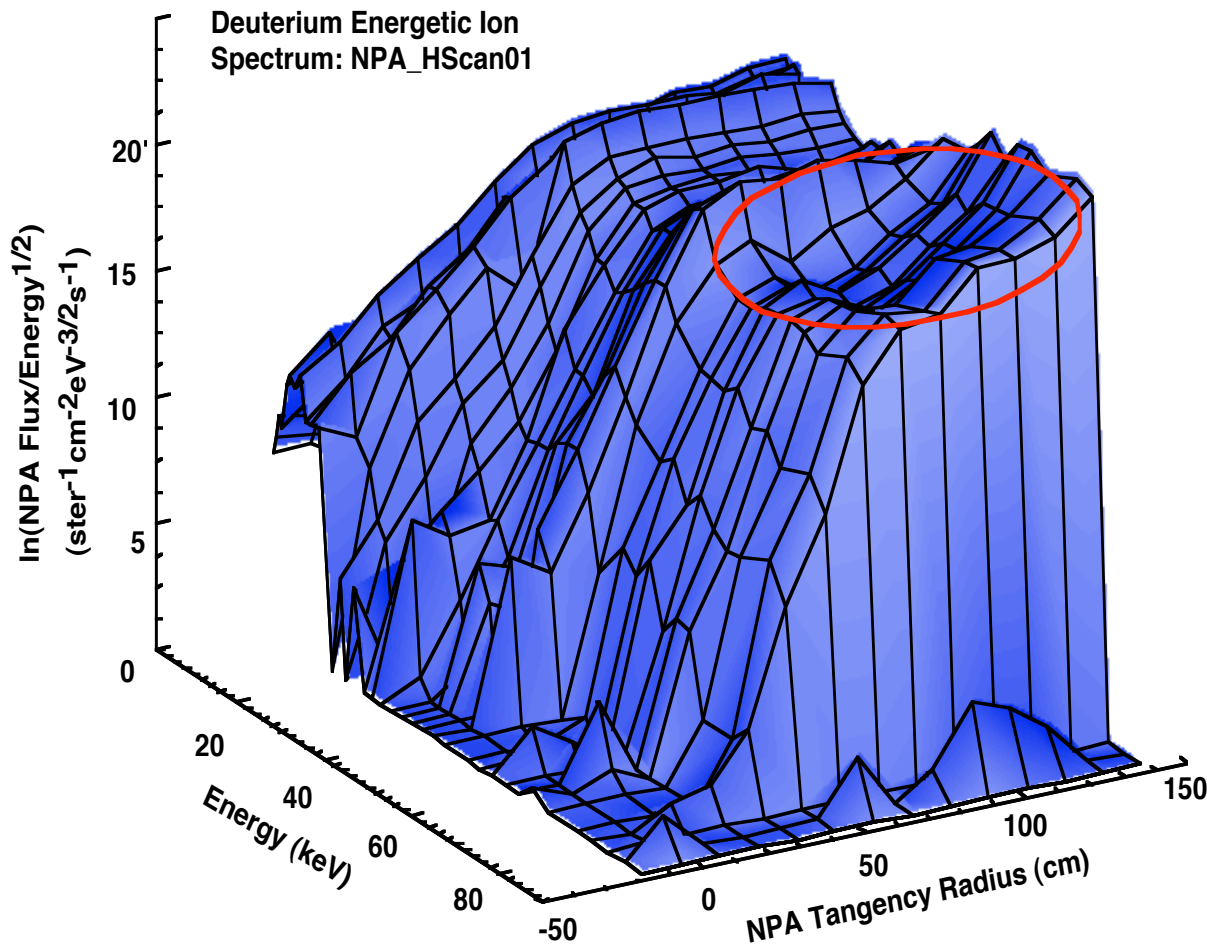
Medley, et al. Nucl. Fusion 44 (2004) 1158

Layout of the EIIB NPA on NSTX



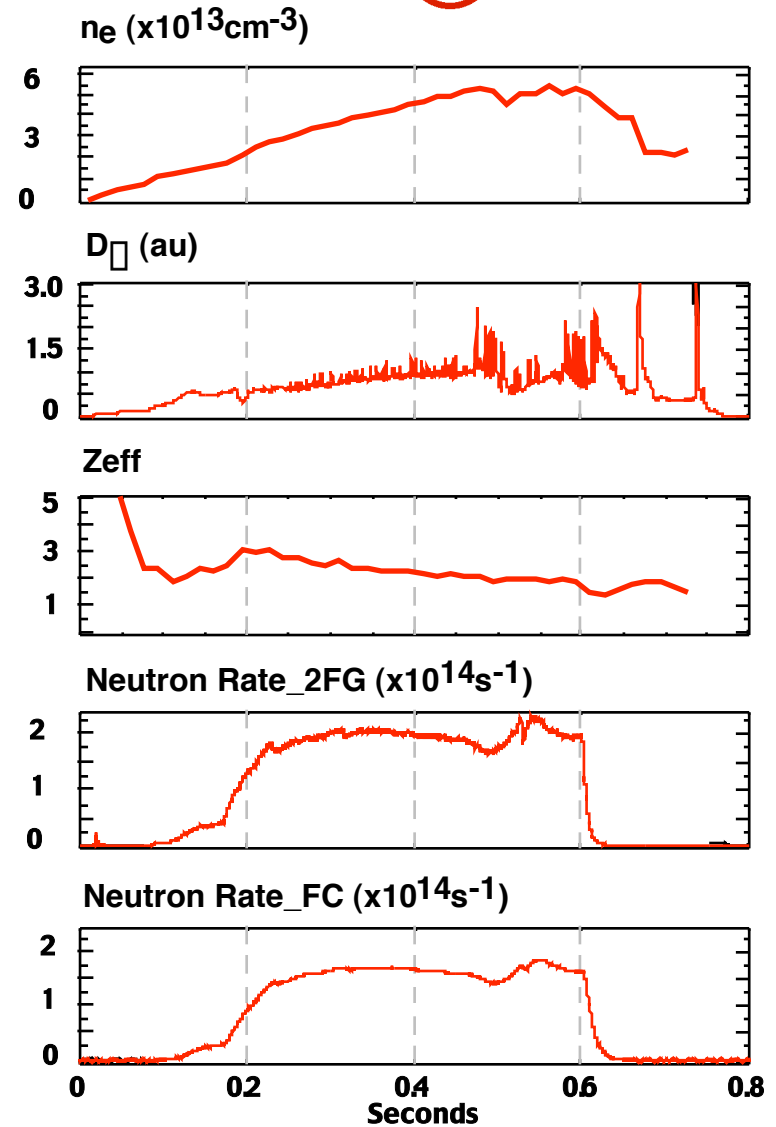
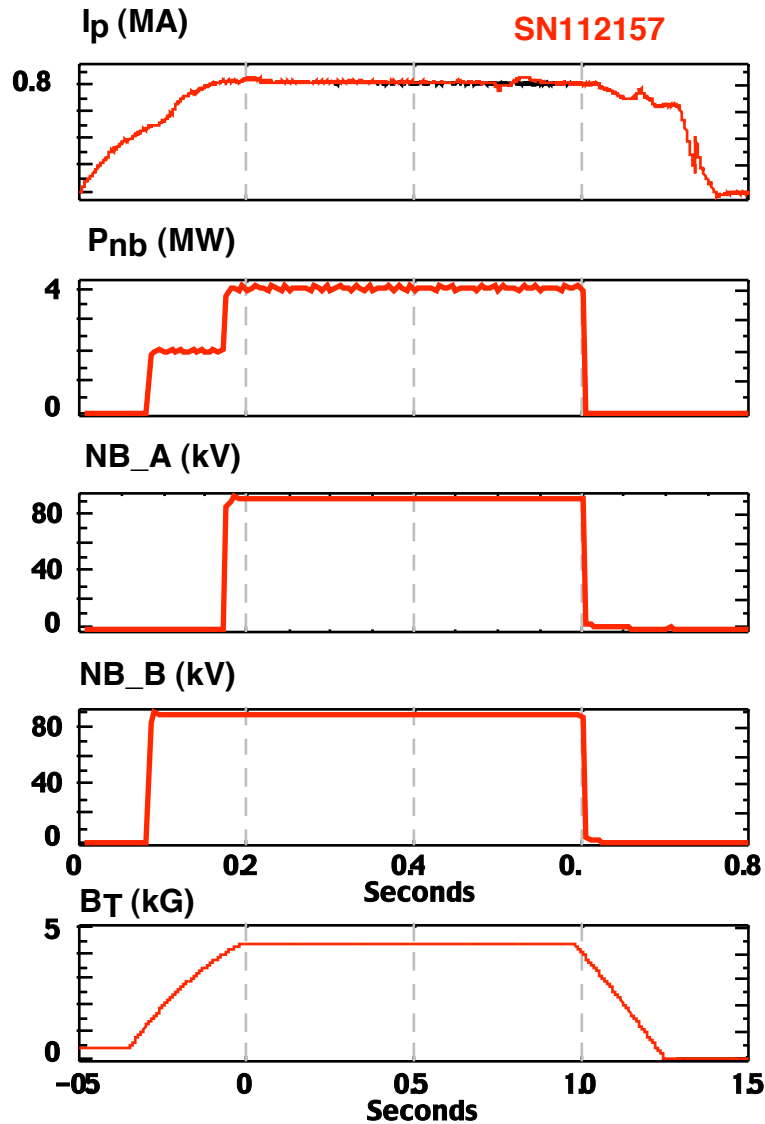
- Positive NPA R_{tan} sightlines view co-going ions: negative R_{tan} view counter-going.

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 $60 < R_{\text{tan}} < 115 \text{cm}$ (encircled region).

XP-504 Candidate Reference Shot



XP-504 Shot Sequence



- Horizontal Scan

| <u>Shot Number</u> | <u>Horizontal Position(cm)</u> | |
|--------------------|--------------------------------|--------------------------|
| 1 | 125 | <input type="checkbox"/> |
| 2 | 100 | <input type="checkbox"/> |
| 3 | 75 | <input type="checkbox"/> |
| 4 | 50 | <input type="checkbox"/> |
| 5 | 25 | <input type="checkbox"/> |
| 6 | 0 | <input type="checkbox"/> |
| 7 | -25 | <input type="checkbox"/> |
| 8 | -50 | <input type="checkbox"/> |
| 9 | -75 | <input type="checkbox"/> |
| 10 | -12.5 | <input type="checkbox"/> |
| 11 | 12.5 | <input type="checkbox"/> |
| 12 | 37.5 | <input type="checkbox"/> |
| 13 | 62.5 | <input type="checkbox"/> |
| 14 | 87.5 | <input type="checkbox"/> |
| 15 | 112.5 | <input type="checkbox"/> |
| 16 | 125 | <input type="checkbox"/> |

• 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)

- Finalize reference discharge with early H-mode (sources A & B @ 90 keV).
- **CHERS, MPTS, MSE and magnetics (EFIT) are essential.**
- Perform horizontal scan over range $-75 < R_{\text{tan}}(\text{cm}) < 125$ (~ 16 shots)
- Scan Source B energy in range 60 -100 keV and measure loss at optimum R_{tan} (~4 shots). Source A @ 90 keV required for MSE.
- 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 EIB and Solid State NPAs on NSTX



Source C: $R_{tan} = 48.7 \text{ cm}$

B: $R_{tan} = 59.2 \text{ cm}$

A: $R_{tan} = 69.4 \text{ cm}$

