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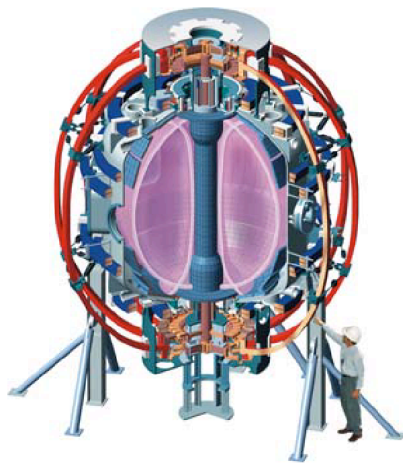
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Effect of Pitch Angle on MHD-induced Energetic Ion Redistribution or Loss using Neutral Particle Analyzer Vertical Scanning

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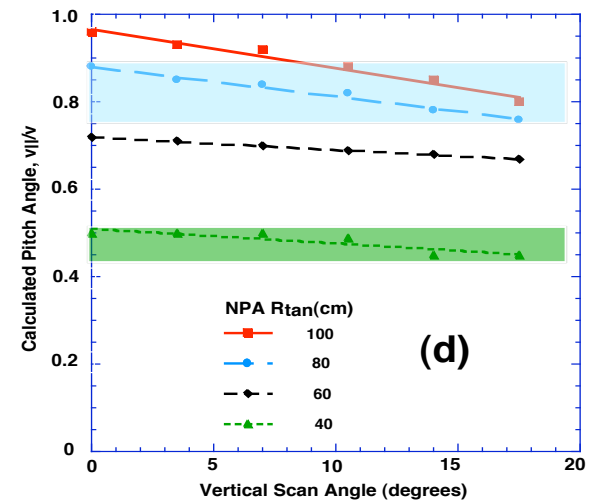
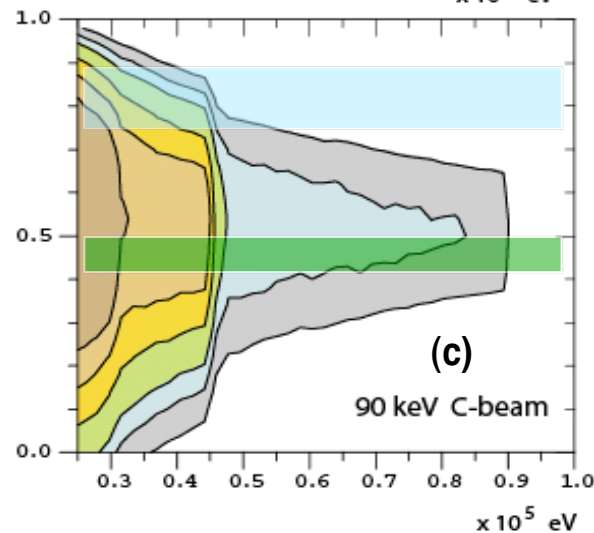
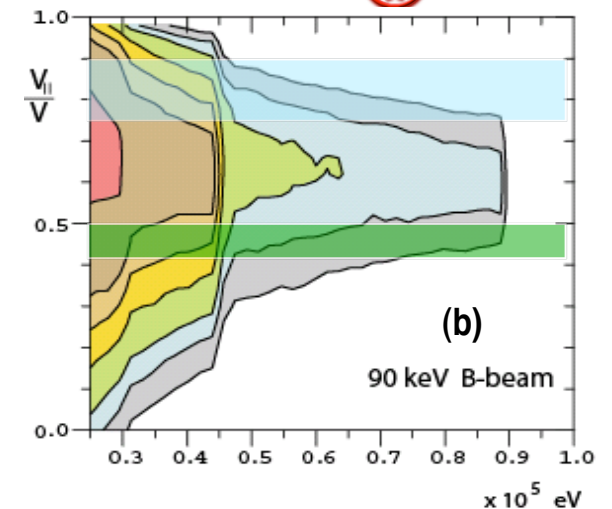
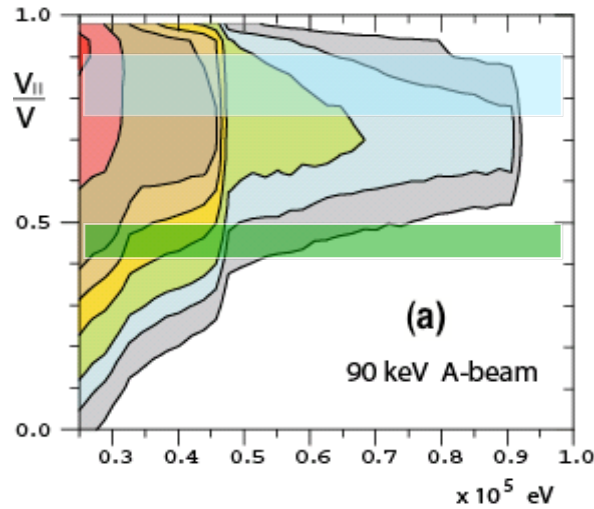
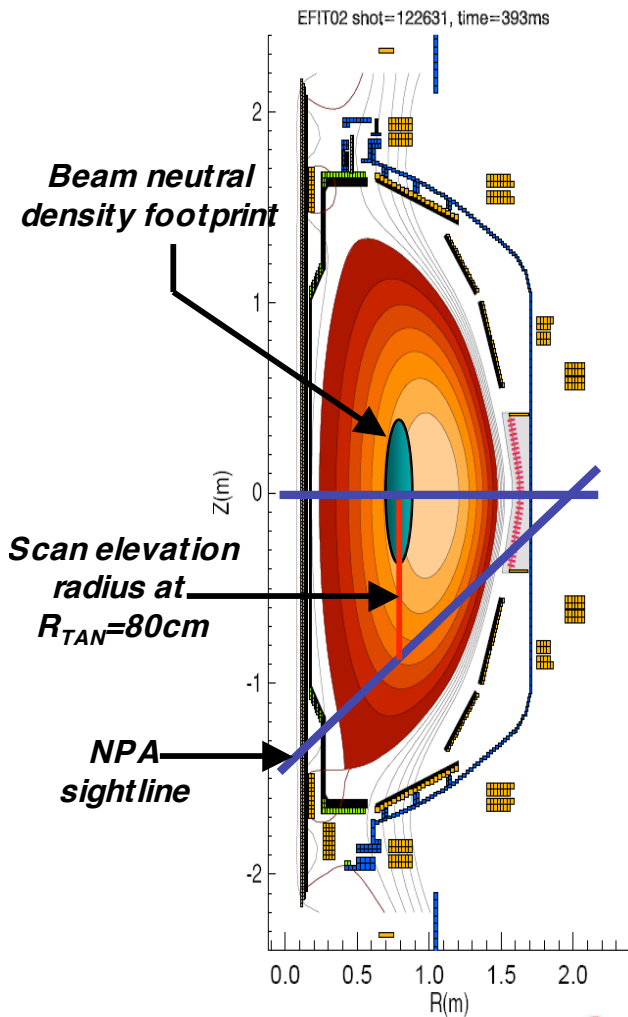


NSTX XP807

April 7, 2008

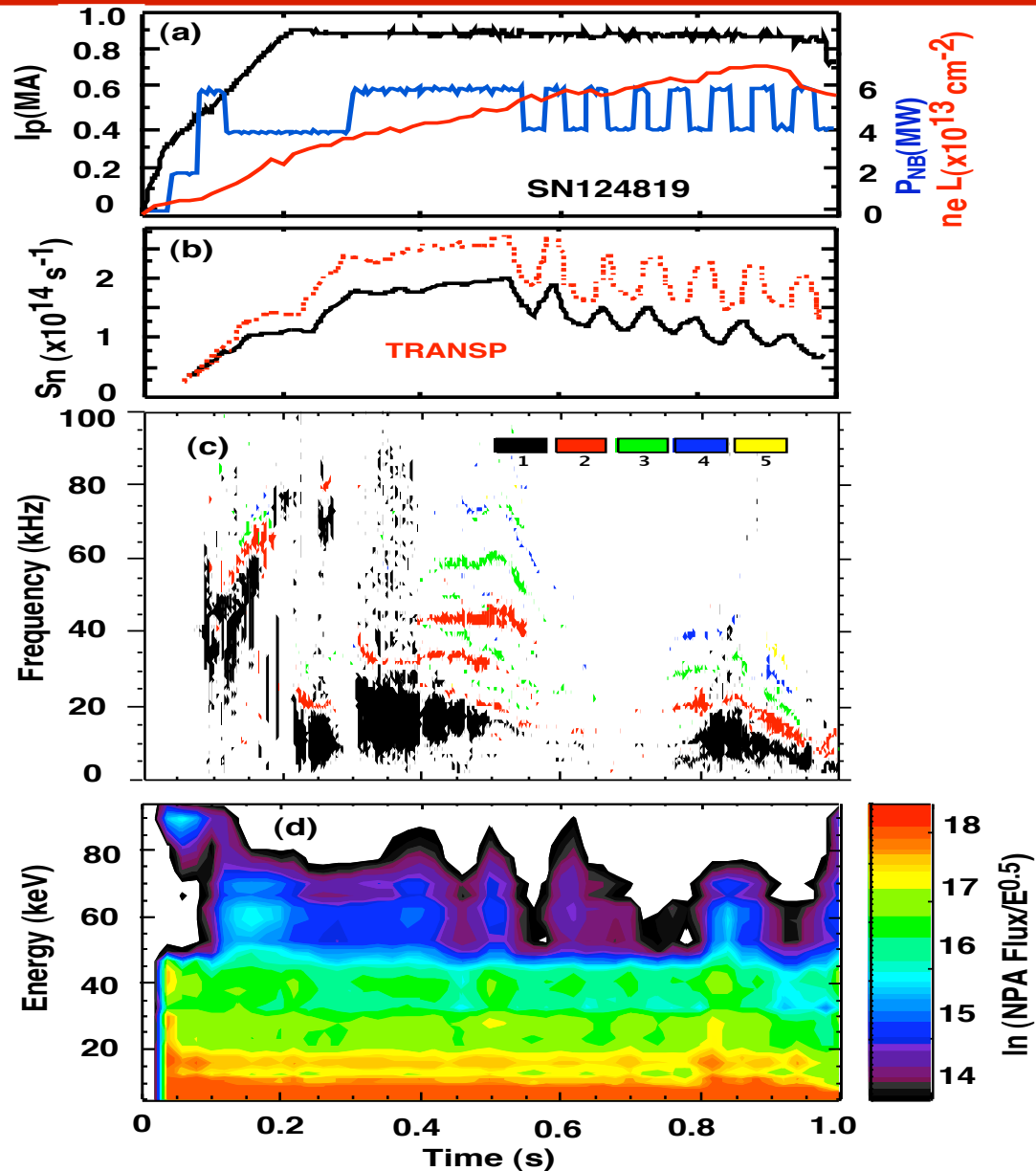
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XP-807 Addresses NPA Vertically Scanning Measurement of MHD-induced Energetic Ion Redistribution at Reduced Field Pitch: $v_{||}/v \sim 0.47 \pm 0.03$.



• XP-707 documented in “Neutral Particle Analyzer Vertically Scanning Measurements of MHD-induced Energetic Ion Redistribution of Loss in the National Spherical Torus Experiment,” Medley, et al., PPPL-4270, November (2007)

XP-807 also Addresses NPA Vertically Scanning Measurement of Energetic Ion Redistribution during MHD “Quiescent” Phase - e.g. SN124819.



- H-mode with $I_p = 0.9 \text{ MA}$, $B_T = 4.5 \text{ kG A, B, C @ } 90 \text{ keV}$ and $P_{NB} \Rightarrow 6 \text{ MW}$ with Source B notches.

- TRANSP neutrons $\sim 1.25x$ measured.

- Stable outer gap $\sim 10 \text{ cm}$ early in discharge and density ramp-up to $n_e(r) = 6 \times 10^{13} \text{ cm}^{-3}$.

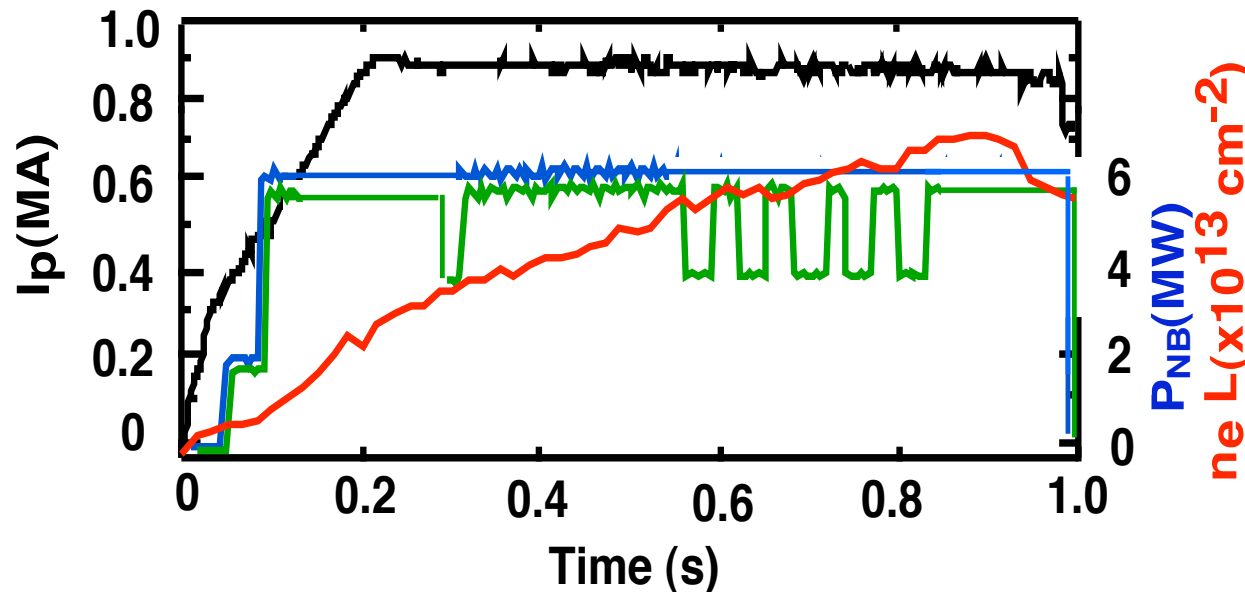
- Energetic ion depletion above $E/2$ after H-mode onset at $t \sim 0.1 \text{ s}$.

- Even during the ‘Low - f Quiescent’ phase, however, $\delta B_{\text{Low}}/\delta B_{\text{High}} \sim 4$.

Target Discharge: SN 124819 with Modified NBI Timing



- 1) Develop target discharge with robust MHD activity at $f < 100$ kHz using SN124819. Include Source B notches: $\delta t = 10$ ms at $t \sim 200$ -300 ms for FIDA and a train of 3-5 notches (depending on pulse length) with $\delta t = 30$ ms off/on starting at $t \sim 550$ ms to induce MHD quiescent period.
- 2) During target development, scan horizontal tangency radius for optimal NPA spectrum and modulation: $R_{\text{tan}} = 50, 60, 70$ cm.
- 3) Backup reference discharge is a fiducial with modified NBI timing.
- 4) XP-807 (Medley) provides scenario development for XP-831 (Ross).



Run Plan Details: NPA Vertical Scan Sequence

(Total shots: 10 - 16, including setup)



<u>Shot Number</u>	<u>Vertical Angle (degrees)</u>	
1	0	<input type="checkbox"/>
2	3.0	<input type="checkbox"/>
3	6.0	<input type="checkbox"/>
4	9.0	<input type="checkbox"/>
5	12.0	<input type="checkbox"/>
6	15.0	<input type="checkbox"/>
7	18.0	<input type="checkbox"/>
8	16.5	<input type="checkbox"/>
9	13.5	<input type="checkbox"/>
10	10.5	<input type="checkbox"/>
11	7.5	<input type="checkbox"/>
12	4.5	<input type="checkbox"/>
13	1.5	<input type="checkbox"/>

Machine: 4.5 kG, 0.9 MA, $n_e(0) \sim 6 \times 10^{13} \text{ cm}^{-3}$, GDC between shots

Beams: Sources A, B, C @ 90 keV deuterium

Diagnostics: Magnetics for EFIT equilibria, full kinetic diagnostics, USXR, FIRETIP and sFLIP