X-Point Height and H-mode P_{th} (Gyrocenter shift vs. l_c)

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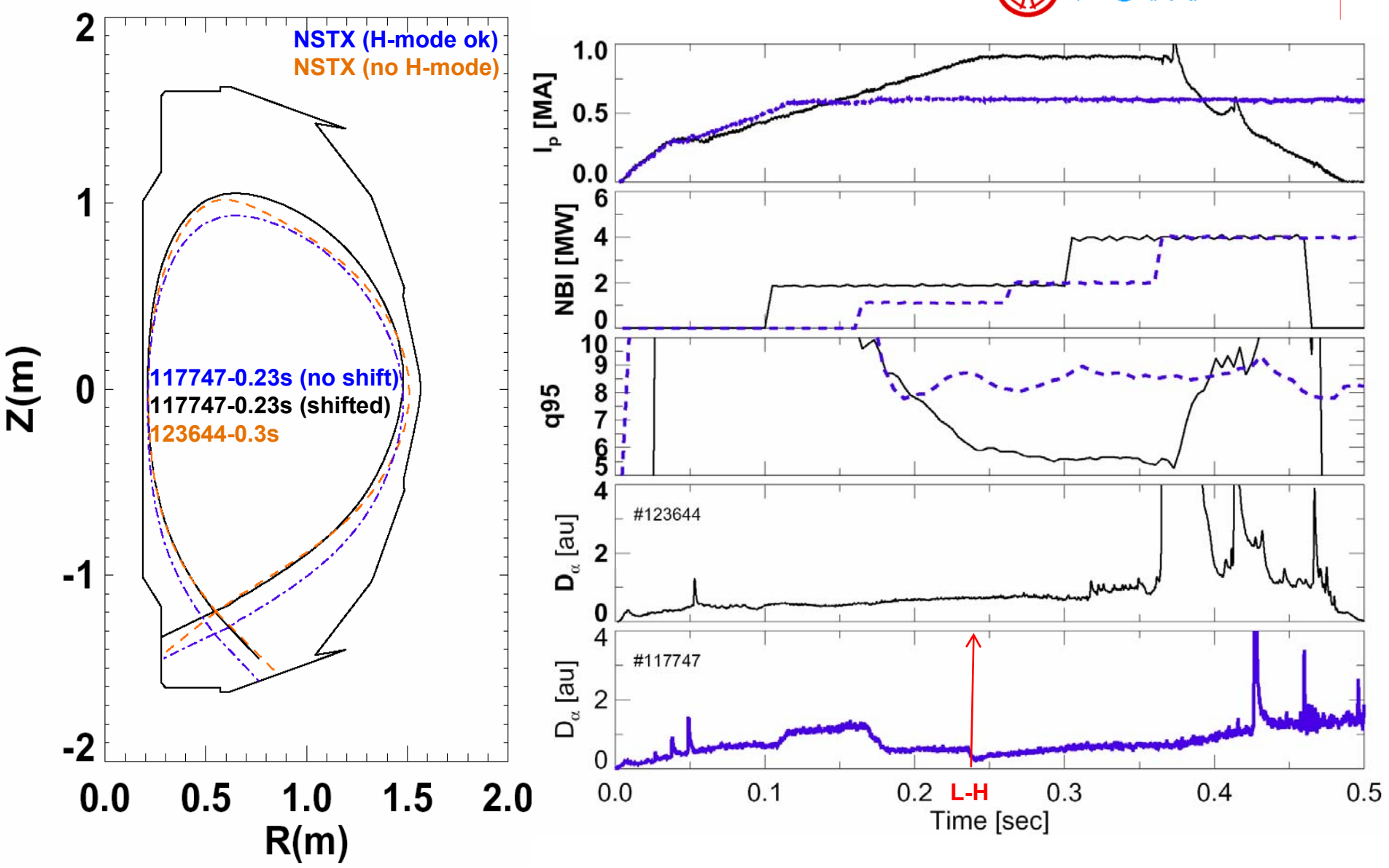
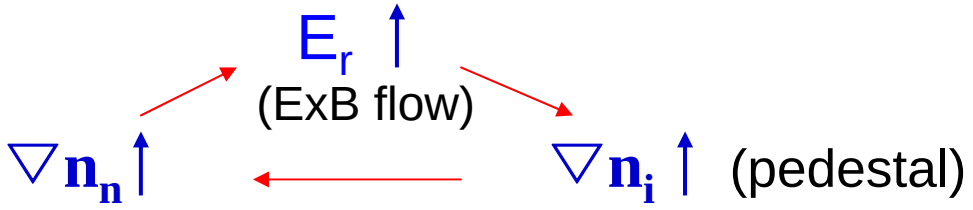
NSTX shot with downward z-axis shift had H-mode access (but also lower I_p and higher q_{95})



Background Physics on X-point and H-mode P_{th} (Gyrocenter shift and connection length)

$$J_x^{GCS} = \frac{m_i n_i n_n}{B} < \sigma_{cx} v_i > \left(\frac{E}{B} - \frac{\nabla p}{qBn_i} + \frac{T_i \nabla n_n}{qBn_n}\right)$$

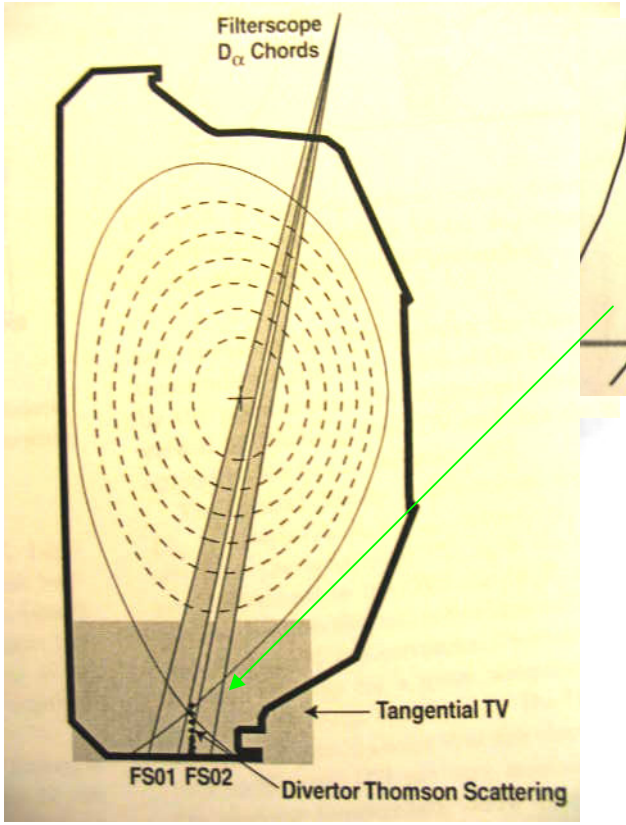


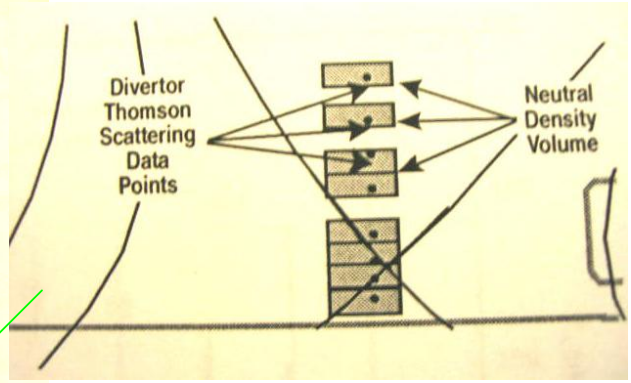
lower X-point height → decrease ∂x → increase ∇n_n (=∂n_n/∂x) → high E_r & low P_{th}

or

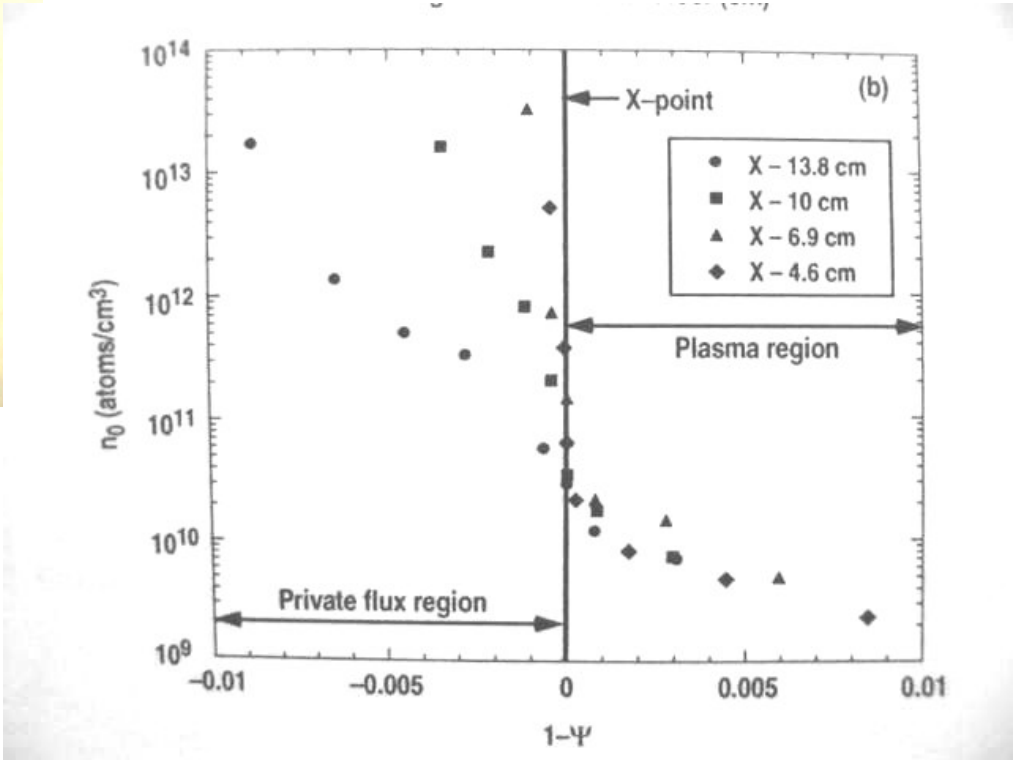
smaller connection length → lower P_{th}

Neutral Density Measurement on X-Point





diverter D-alpha
tangential TV
T.S. [n_e, T_e] (mid pl)
emission= f(n_n,n_e,T_e)
mid plane : D-beta
E_r from ERD



DIII-D
[Colchin, Maingi *et al*., Nuclear Fusion (2000)]

Experimental Run Plan

#117747 : I_p=0.6 MA, B_T=4.5 kG, with NBI power increase (I MW, 2 MW, 4 MW)

1. Start with low X-point height, P_{th} measurement, with all diagnostics (4-5 shots)

2. P_{th} measurement with high X-point (2-3 shots)

3. Increase Ip to 0.8 MA to decrease lc (reduces gas), P_{th} measurement (2-3 shots)

4. Repeat #1 with 0.8 MA (4-5 shots)

Goal : to differentiate effect of Xpt height from lc on H-mode P_{th}

Also important for the study of recycling Influence on H-mode (ELMs & Lithium)

	low Xpt	high Xpt
low I_p (large lc)	O	X
high I_p (small lc)	O	X (?)