



Backups for Talk on NSTX Research Program

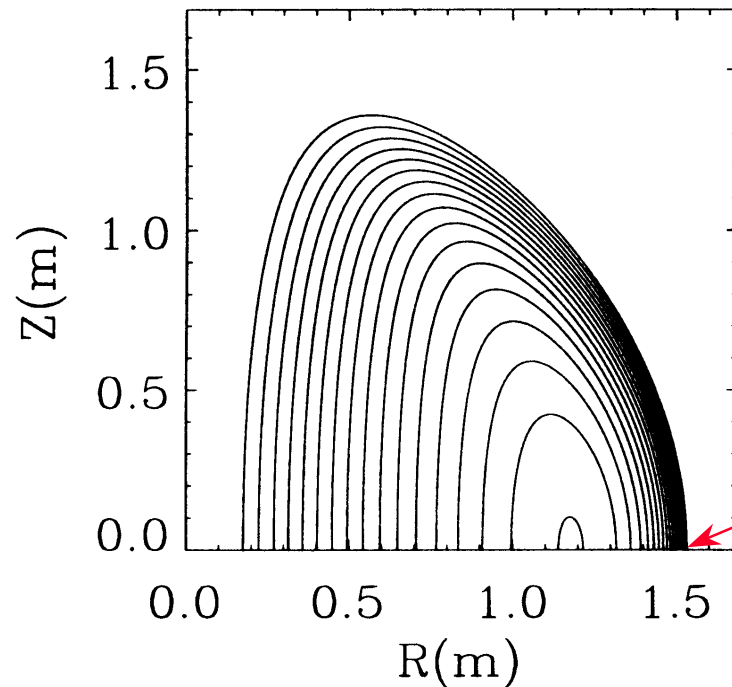
Martin Peng
ORNL@PPPL

FY99 NSTX Research Forum
January 12-14, 1999
Princeton Plasma Physics Laboratory

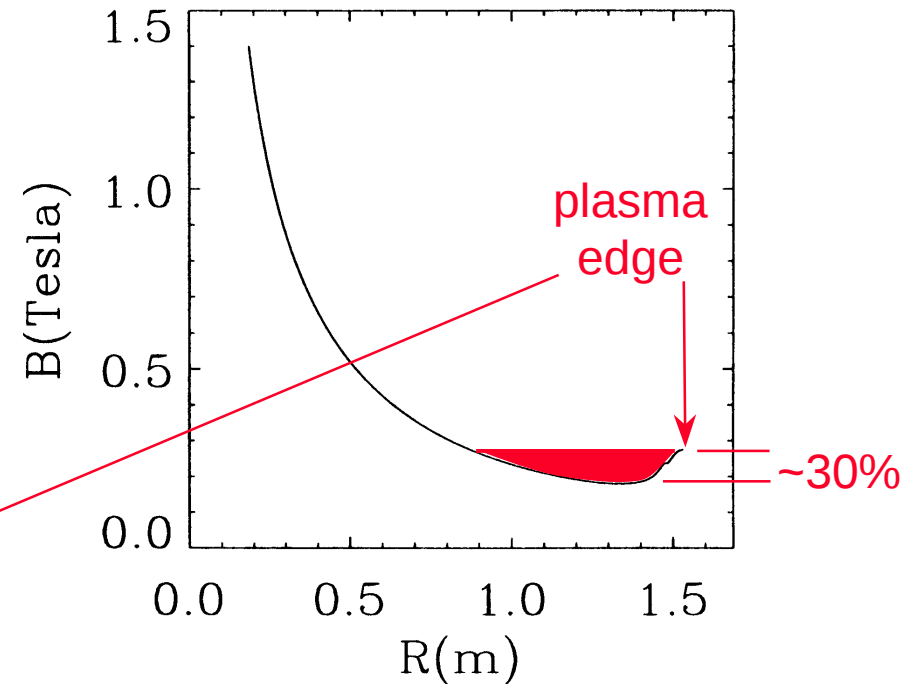
MHD Stable, High Beta ($\beta_t = 40\%$) Plasmas with Strong Well ($\sim 30\%$) in NSTX Are Calculated (Menard)



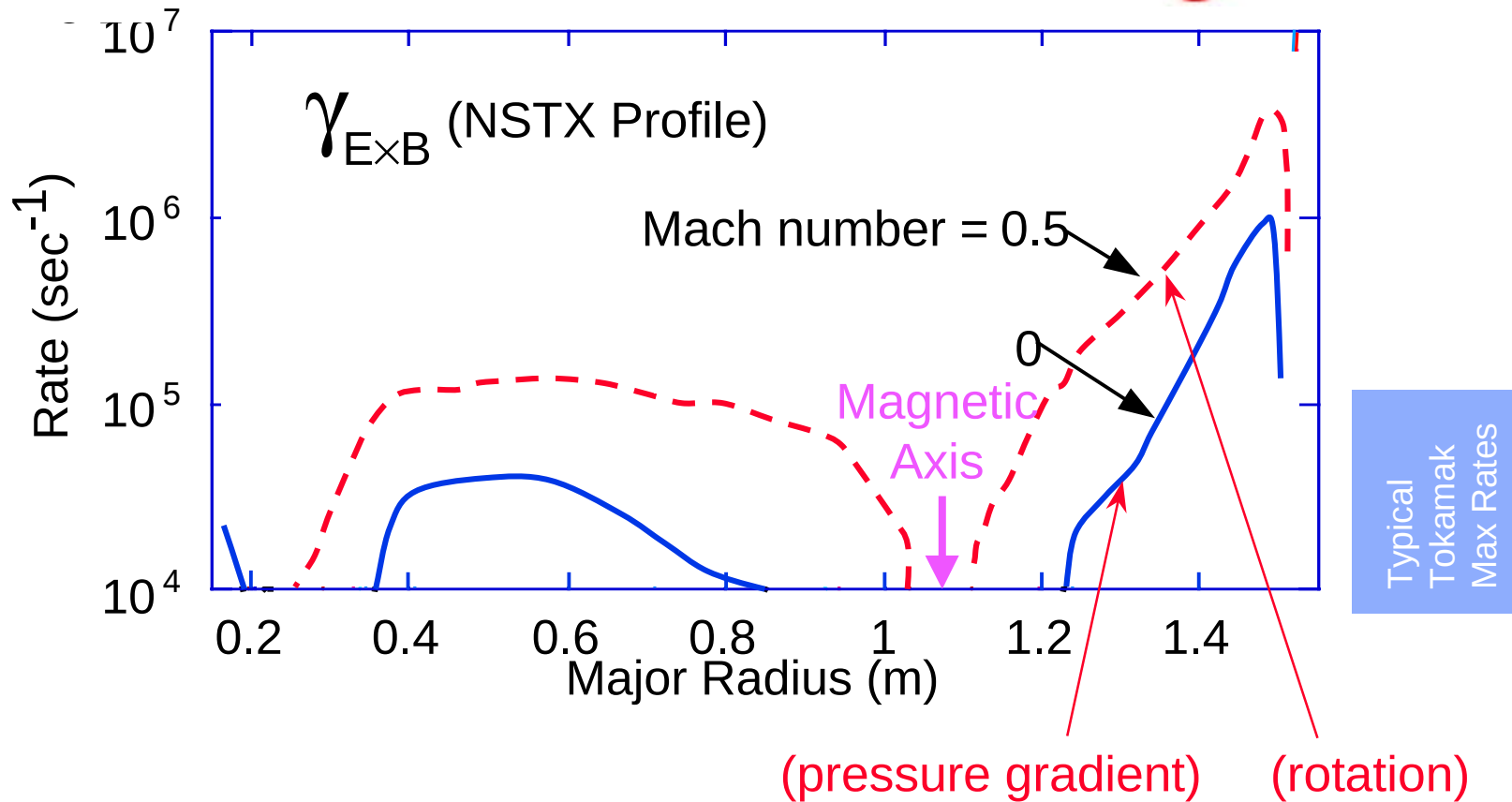
MHD Equilibrium
Flux Surfaces



Magnetic Well ($\sim 30\%$)
on Mid-plane



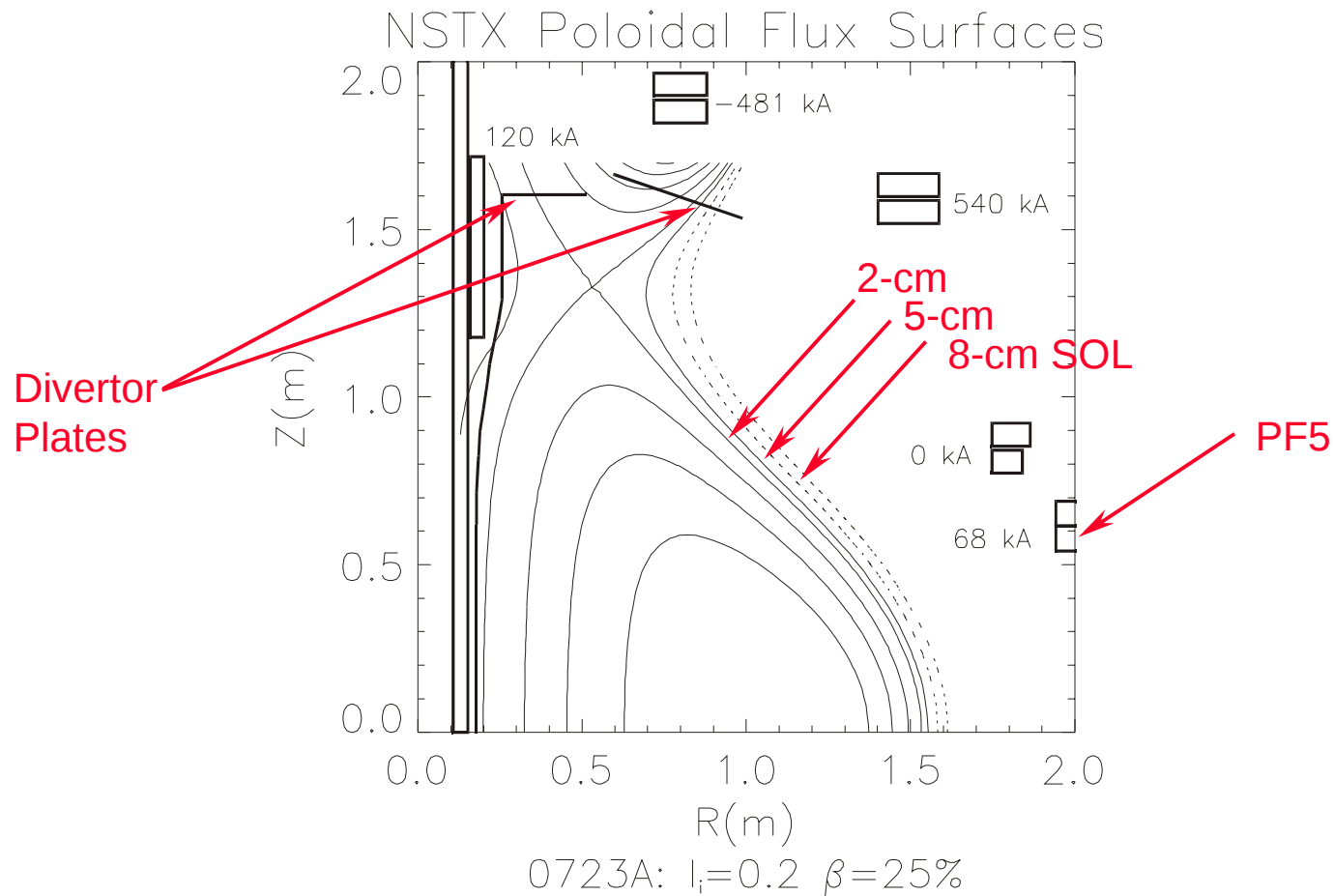
Very High Flow Shearing Rate is Expected in NSTX, Likely Leading to Improved Ion Confinement (Synakowski)



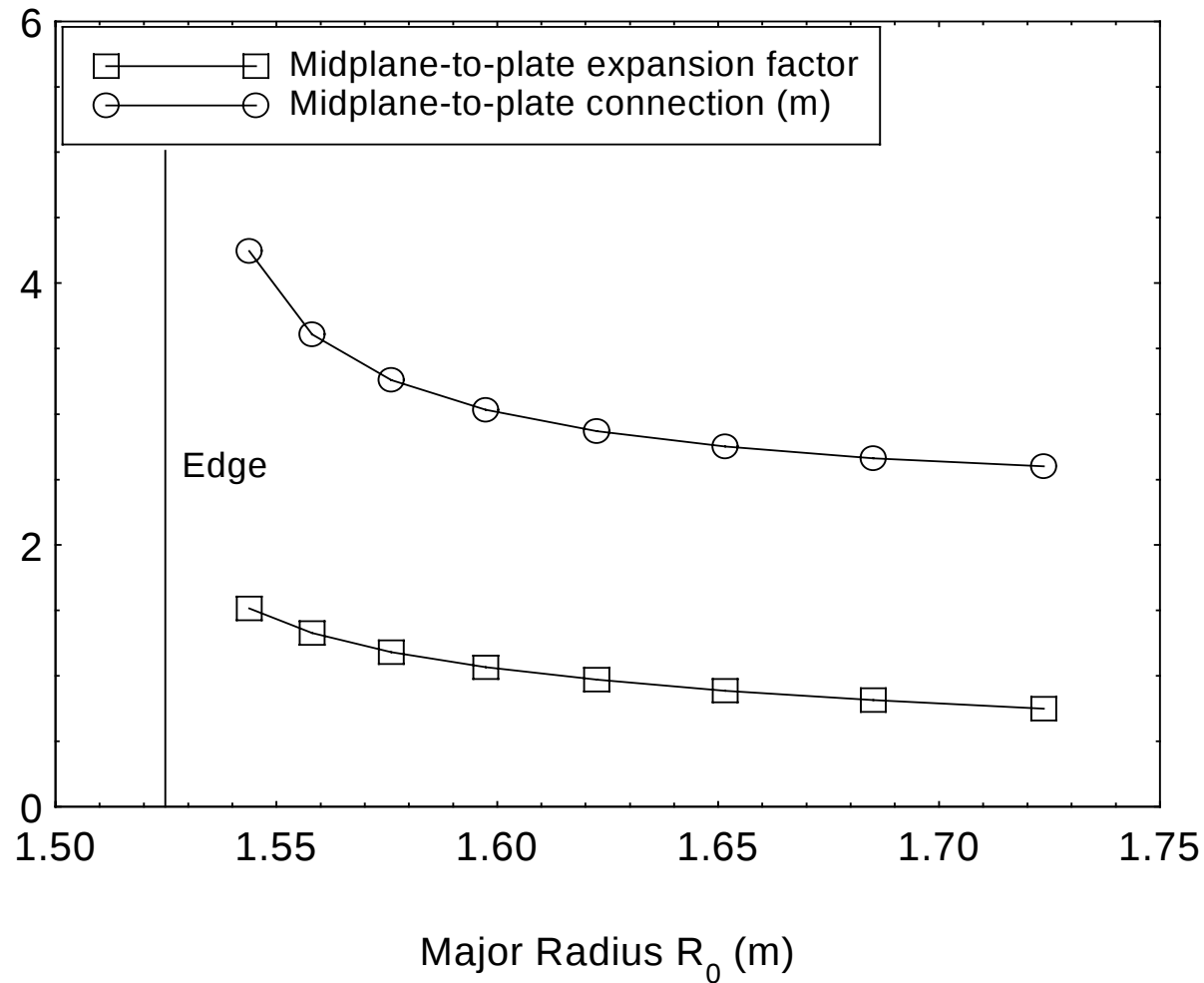
$$\gamma_{E \times B} = (RB_\theta/B) \partial(E_r/RB_\theta)/\partial R \approx (RB_\theta/B) [d(\nabla p/nZ_e RB_\theta)/dR + d(V_\phi/R)/dR]$$

TFTR, DIII-D, JET, JT-60U, etc. observed improved confinement via sheared flow

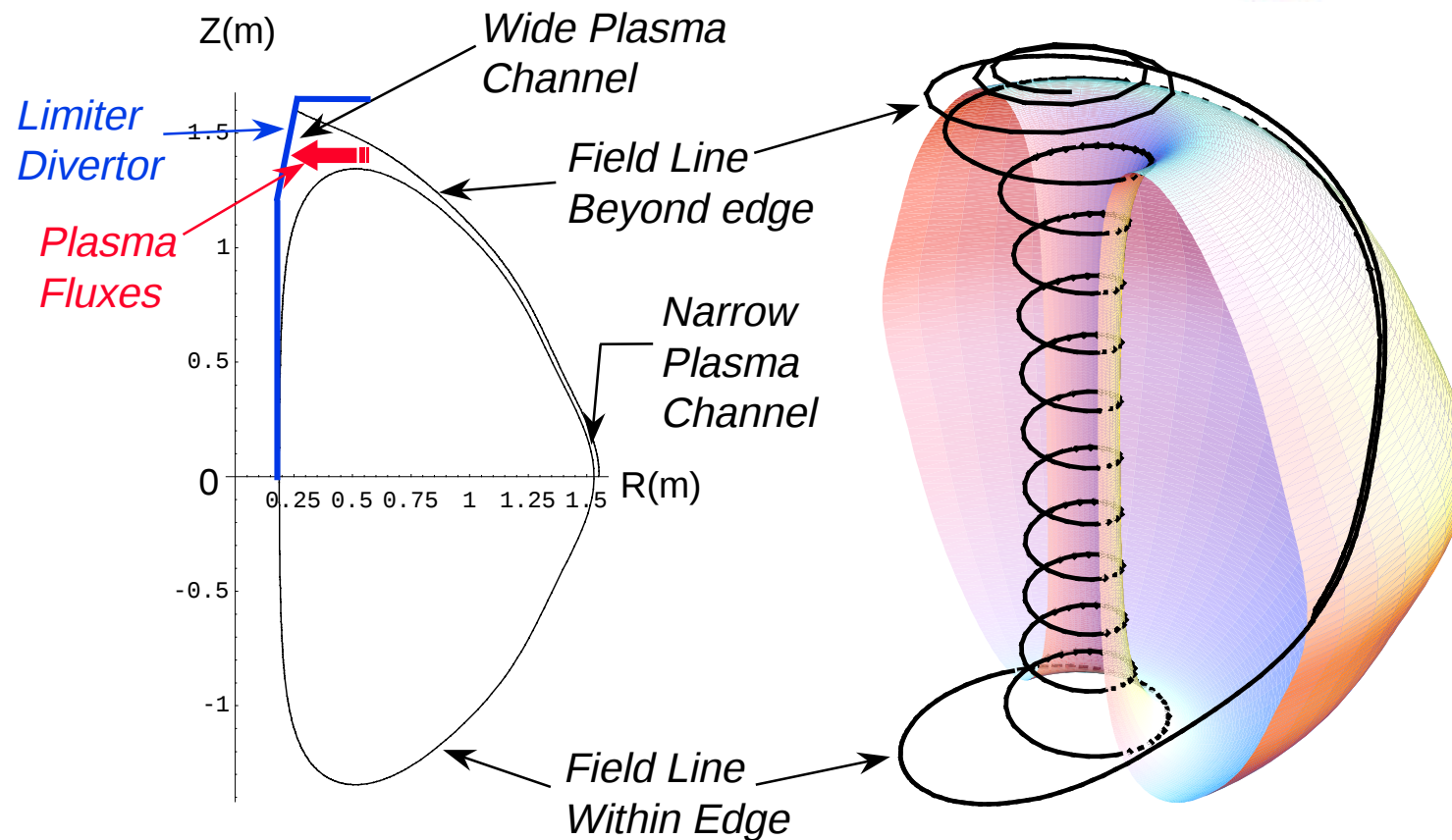
NSTX Will Study Double-Null as Well as Other Equilibrium Divertor Configurations (Strickler)



DND Plasmas in NSTX Has Relatively Modest SOL Expansion and Connection Length

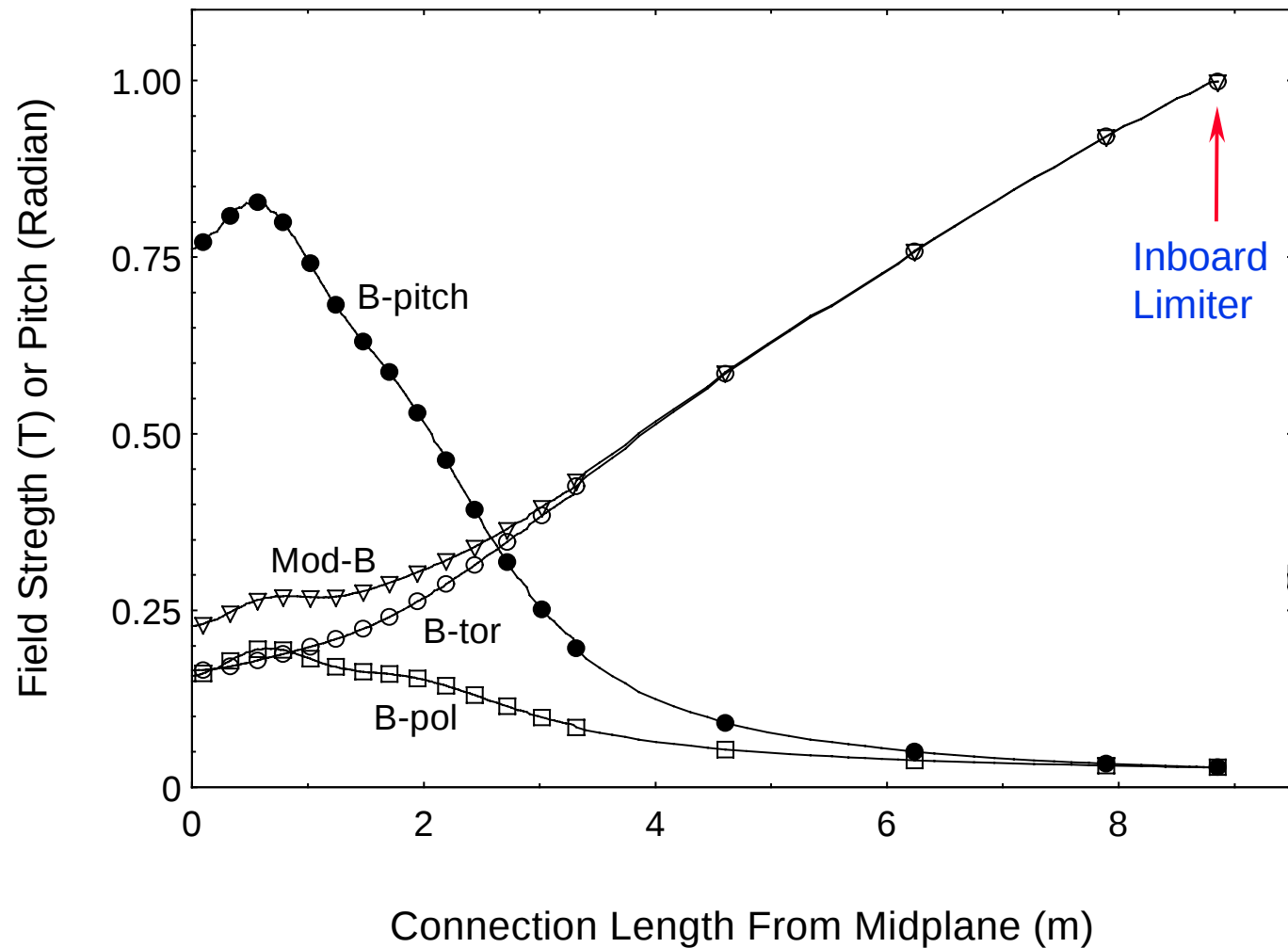


NSTX Inboard-Limited Plasma Exhaust Channel Has Expanded Area of Contact with Material Wall



DIII-D observed H-mode confinement in inboard-limited plasmas

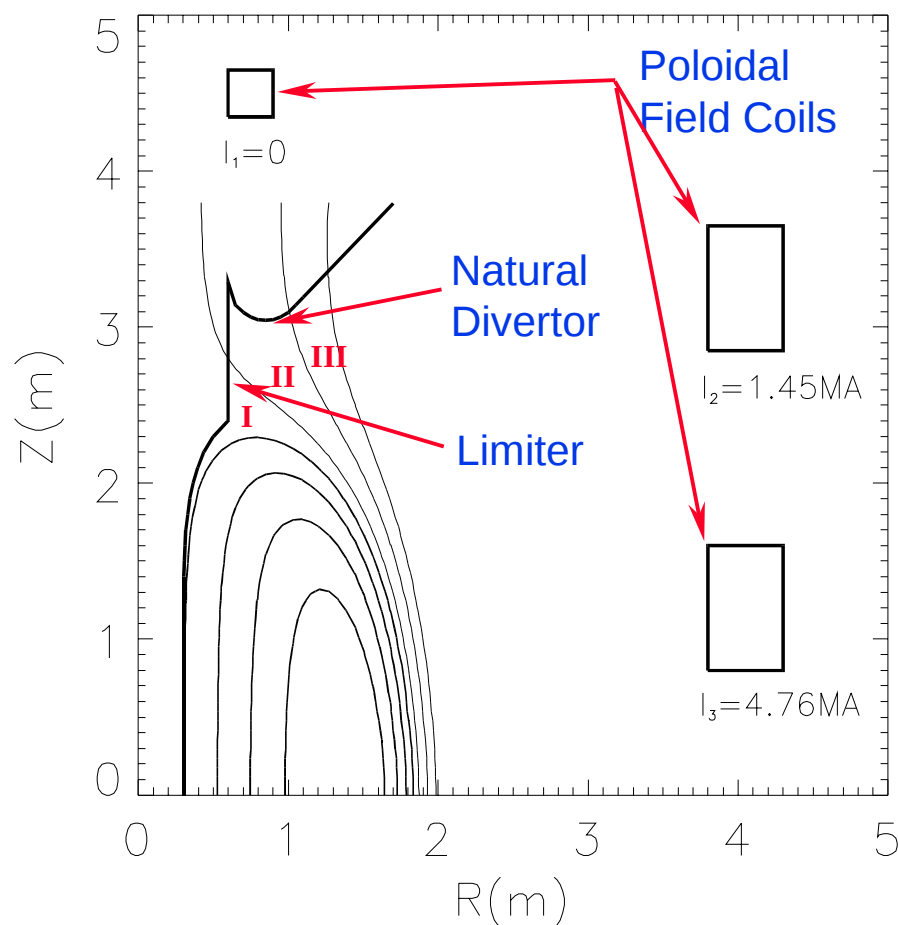
Inboard Limited SOL in NSTX Has Large Magnetic Mirror Ratio (~ 4 at $\Delta=2$ cm)



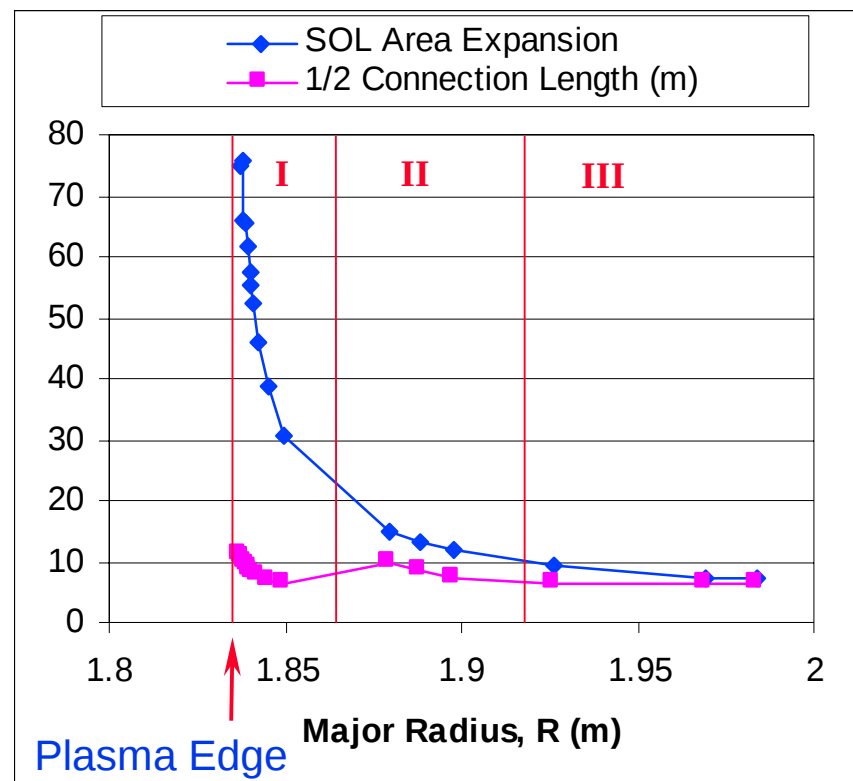
Inboard-Limited Plasmas in VNS Can Design for Very Large Outboard SOL Expansion Factors (Strickler)



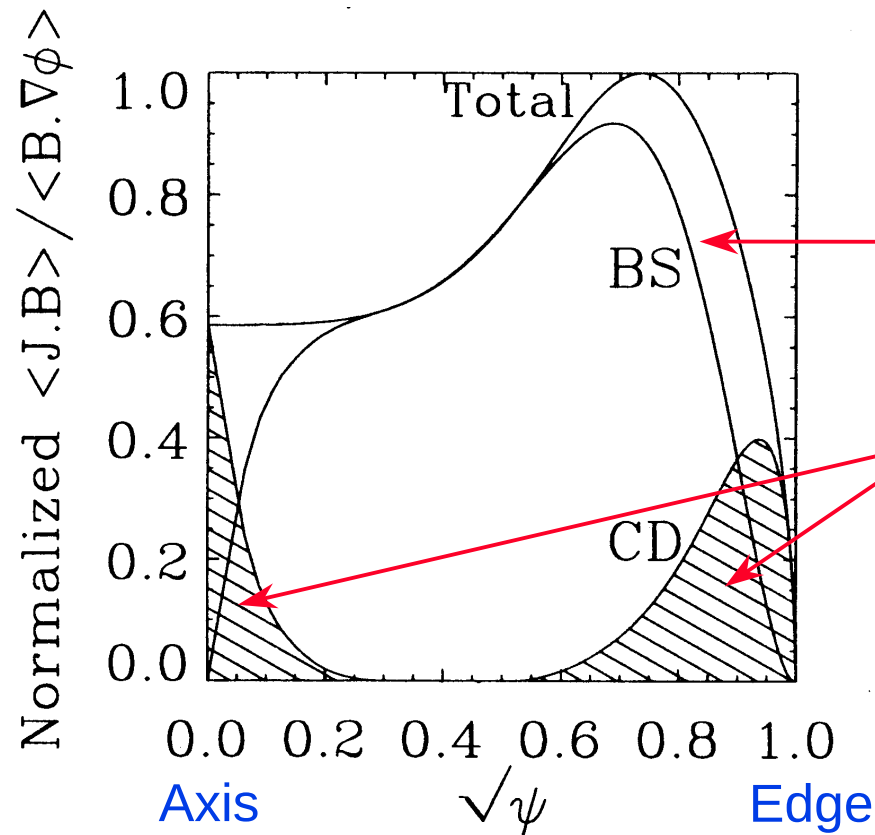
$I_i = .2$ $\beta = 38\%$ $k = 3.0$ $\delta = .38$ $I_p = -14.3\text{MA}$ $B_t = 2.69\text{T}$



I - Limiter
II+III - Divertor



Nearly Self-Driven (BS) Currents at High β Are Also Calculated, Well Aligned with Total Current (Menard)



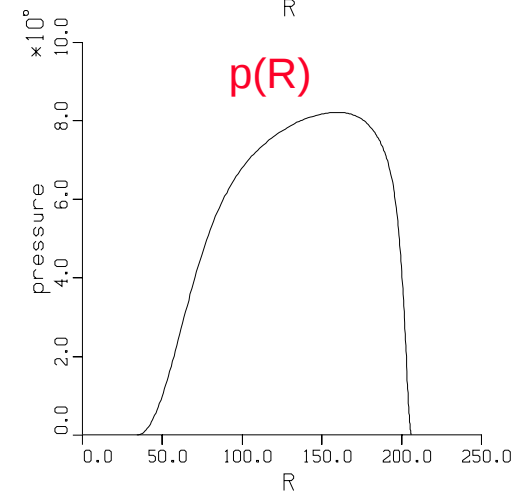
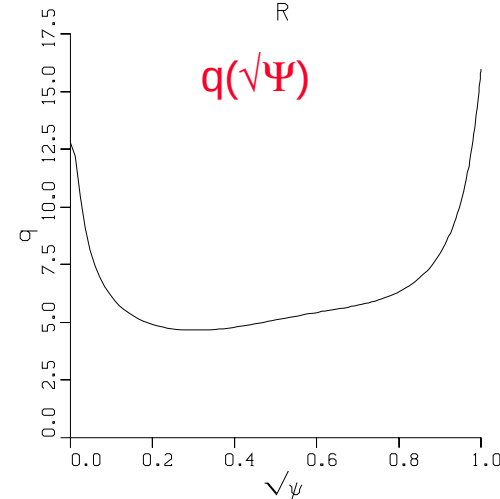
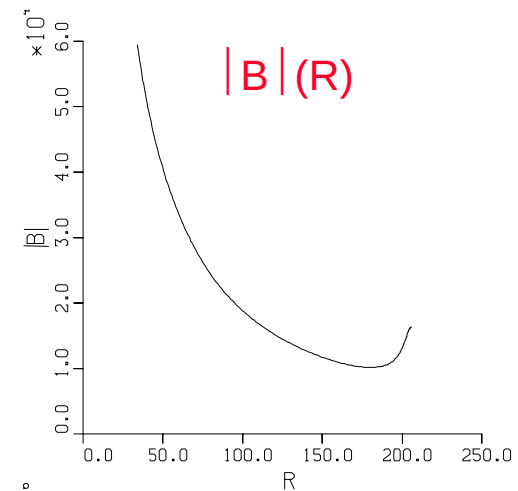
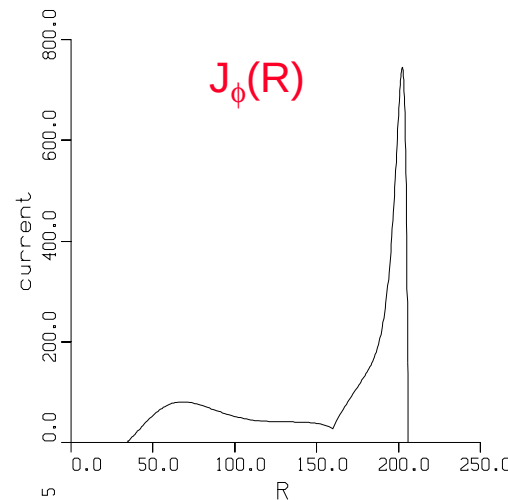
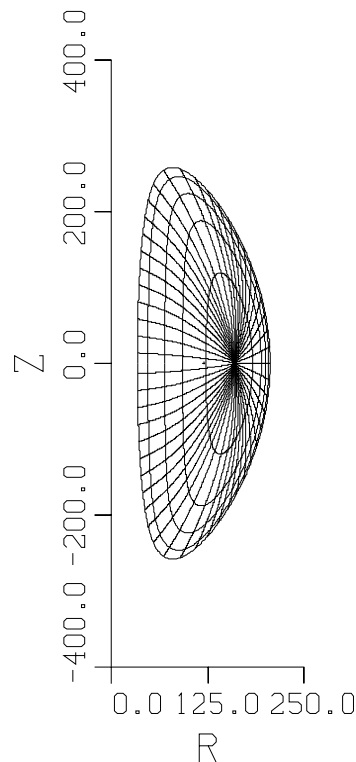
- $\beta_t = 40\%$
- Bootstrap current fraction = 80%
- Modest driven current at axis and near edge

TFTR, DIII-D, JET, JT-60U, etc. observed significant bootstrap current

100% Aligned, Pressure-Driven Currents at High β Are Calculated, Assuming “Potato” Orbit Effects (Shaing)



$I_p = 8.6$ MA ; $\ell_i(3) = 0.16$;
 $\beta_N = 8.5$; $\beta_T = 51\%$;
 Ballooning stable



TFTR, DIII-D, JET, JT-60U, etc. observed significant bootstrap current