Effect of Aspect Ratio on Plasma Confinement and Stability

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Recent scalings indicate strong aspect ratio dependence

$\tau_E \sim A^{-(1.8\text{-}3.3)}$ depending on L or H mode confinement

(fixed, q, κ, B_T, R, etc.)

One way of approaching experiment to test this is to perform intra-machine aspect ratio scaling

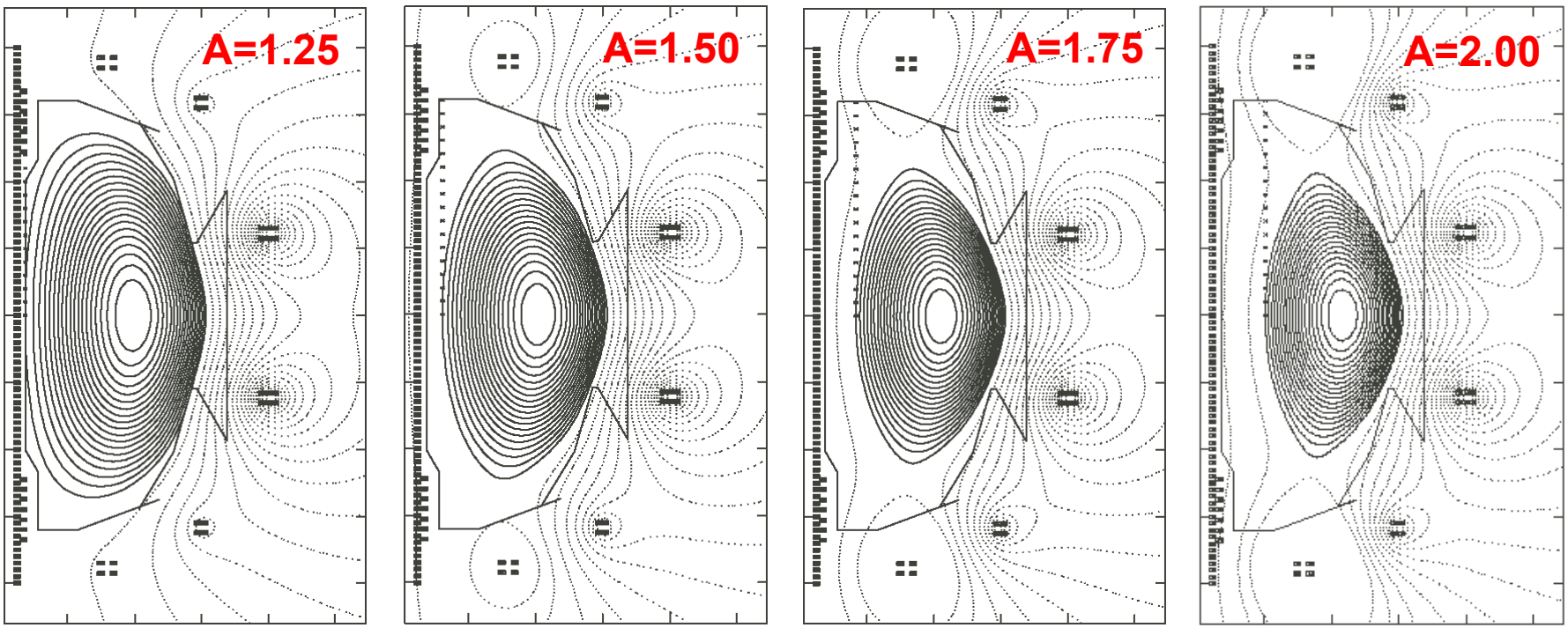
Another way is to compare similar discharges in two different machines (i.e., NSTX and DIII-D)

Here, we will attempt to develop an XP based on an intra-machine experiment

Scenario development needed

- Which geometrical parameters fixed (R-a, R+a, R_0)?
  - Plate coupling, beam heating/confinement
- Which dimensionless variables fixed (q_{cyl}, β)?
  - Higher current capability
- OH vs NBI vs RF heating

Example with R+a, B_t, κ fixed, q_{cyl}~2



Effect of Large Radial Electric Fields on L-H Transitions

S. Kaye, R. Maingi, C. Bush, D. Darrow, ……

Generate large radial electric field using counter-injection

Large losses expected, even at 1 MA (up to 70% losses)

These losses could affect plasma rotation, L-H threshold power (expect lower thresholds)

Operate at >1 MA with counter-injection (reverse both B_T and I_p) to start out with minimal losses

Reduce I_p gradually and monitor rotation, look for L-H transition

Carefully monitor heat flux to material surfaces using IR camera

XP19 Extension: Global Confinement Scaling

S. Kaye et al.,

Continue to characterize parametric scaling of global confinement

Compare previous results to those with different machine conditions/operations

- Error field correction
- Inner wall gas feed (higher density)
- Bake out (wall conditions/cleanliness/higher density)
- Higher toroidal field ($\leq$ 6 kG)