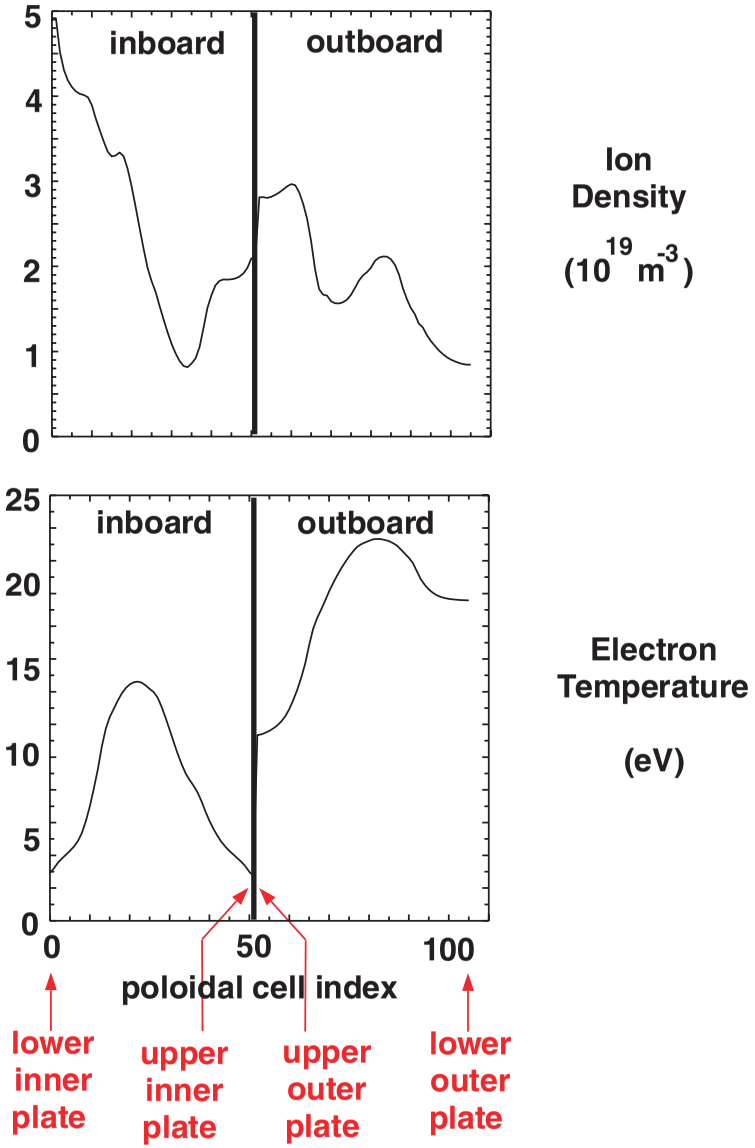
Poloidal Asymmetries, Transport and Divertor studies

By
J. Boedo
and
H. Kugel, R. Maingi

For the UCSD and NSTX Teams

Acknowledge contributions/discussions with S. Krashenninikov, G. Porter, P. West

UEDGE profiles feature strong poloidal asymmetry



- Edge profiles in NSTX feature poloidal asymmetry
- At least two poloidal measurements are needed to perform basic benchmarking
- Midplane and floor probes essential. However, divertor regions shows large gradients.
- Divertor profiles are thus important to unravel physics and feed codes.

Turbulent transport shows strong poloidal asymmetry

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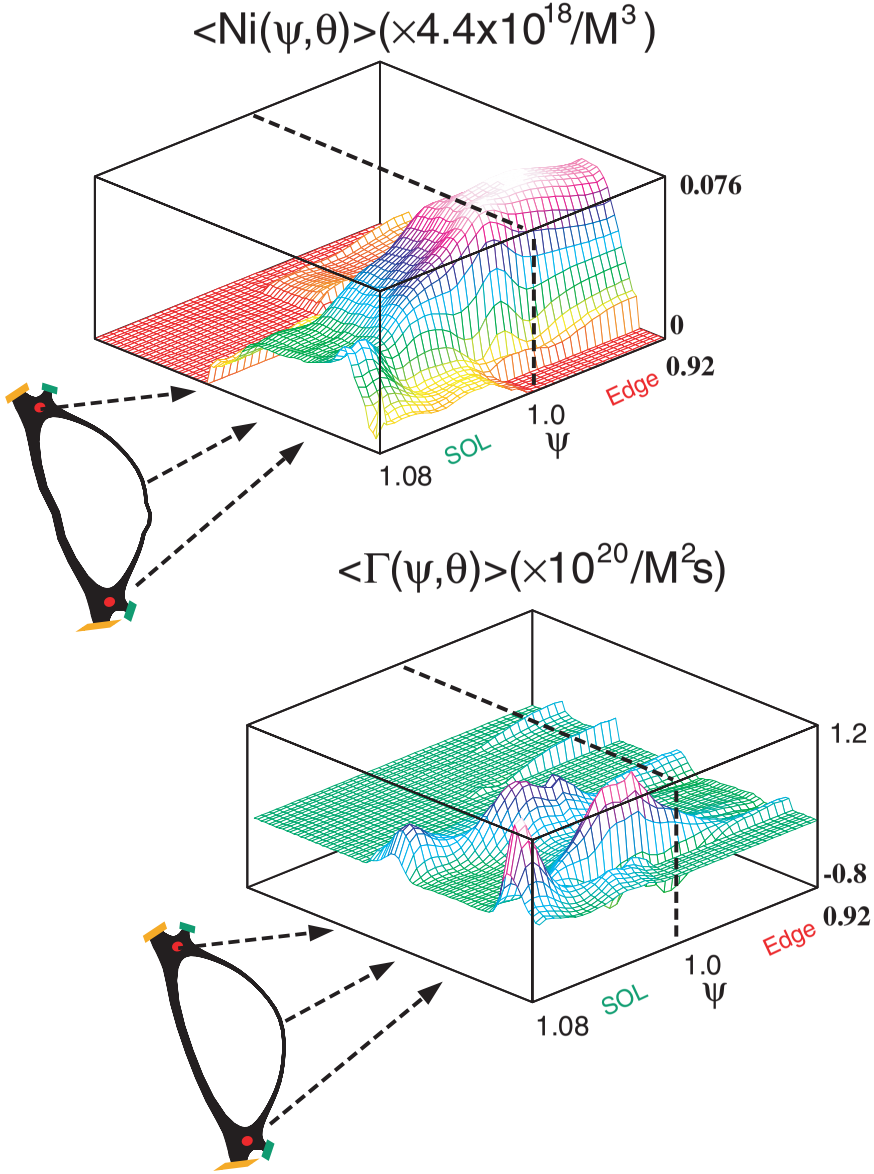
- Fluctuating quantities in NSTX feature poloidal asymmetry
- At least two poloidal measurements are needed to perform basic benchmarking
- X-point structure is particularly rich



Divertor Region Features Complex 2-D Structure

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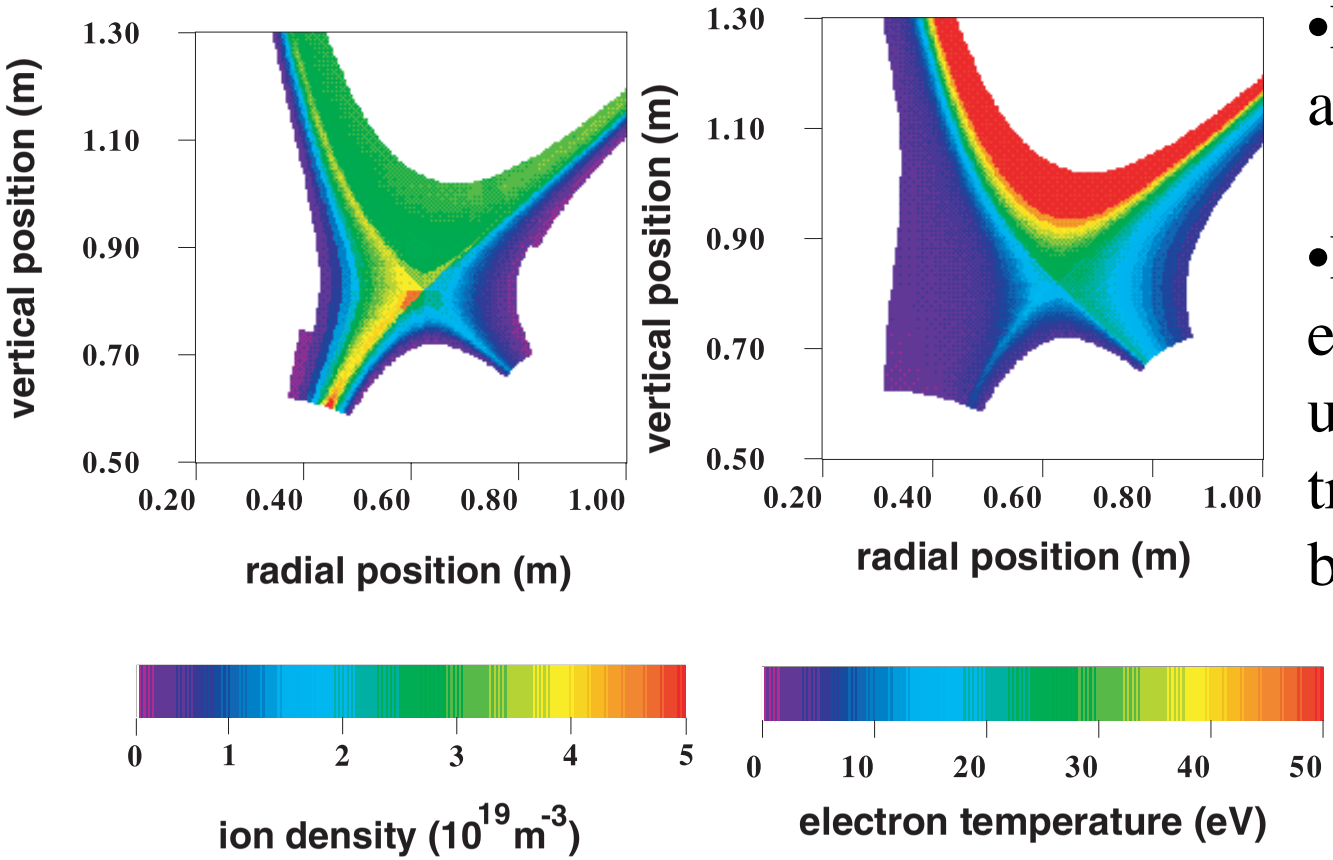

- Divertor gradients are strong
- Divertor profiles are essential to understand impurity transport and power balance

- During detachment, divertor plasmas develop strong flows and large gradients.
- I.e. divertor measurements become essential during high power operation

Two Scanning probes will provide poloidal coverage

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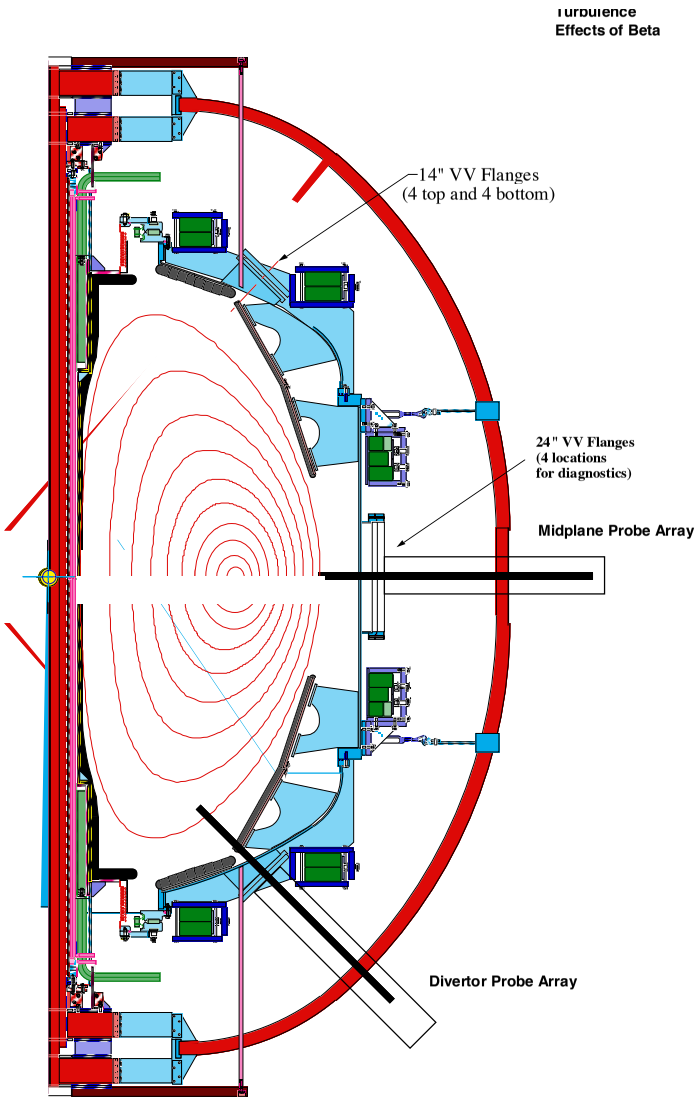

- Poloidal coverage to benchmark codes and provide essential poloidally-resolved information.

- BONUS: Obtain divertor coverage as well.

- Divertor probe coverage needed to understand:
  - ExB drifts
  - Divertor asymmetries
  - Flows

Physics: Average profiles

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- Edge measurements to support RF heating
  - oNe, Te, Vp, Er

oScalings of heat and particle fluxes

oPoloidal variations/asymmetries

  - oAdd divertor probe and provide extra point along field line
  - oBenchmark codes
  - oEr measurements >>shear stabilization, H-mode

oCHI support (need probe closer to divertor)

Physics: Fluctuating quantities

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- ExB transport (Intermittent convective and Diffusive)
  - Fast Ne, Te, Epol, Vp
  - oBroadband ExB
  - oIntermittent convective ExB (spiky transport) and -GradB
  - oReynolds Stress/Zonal flows
  - oEnergy cascades/Bicoherency
- Electromagnetic transport
  - Fast Bpol, Br
  - Reynolds stress (magnetic)
- CHI issues (intrinsically fast)

Physics: Divertor

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- Divertor Physics
  - ExB drifts
  - In-out asymmetries
  - Plasma flows
  - Physics of detachment
  - Turbulent transport asymmetries