

Edge Biasing Effects on Plasma Stability, Confinement, etc.

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NSTX Forum
11/01

- Inner wall bias experiment
- Other biasing ideas for NSTX

Some papers on divertor bias experiments:

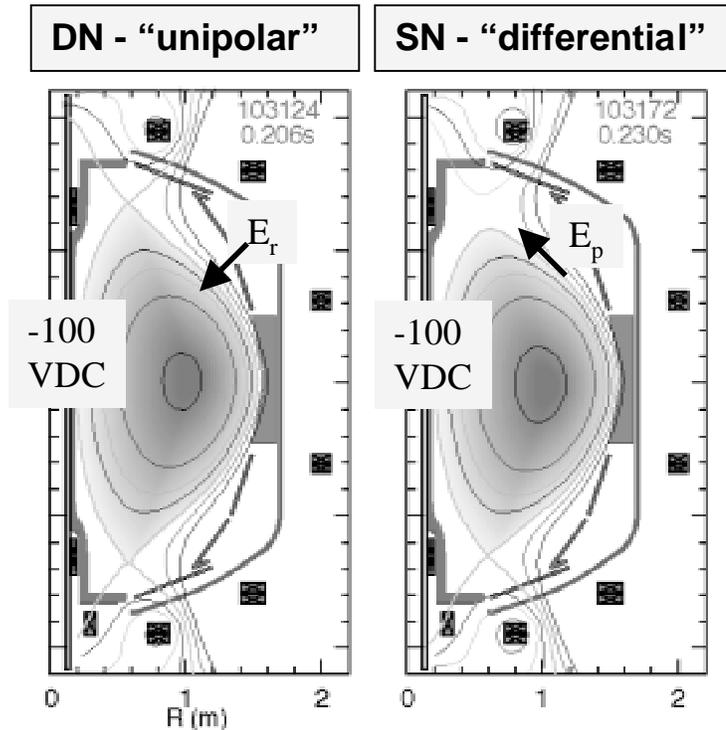
Review: Stabler J. Nucl. Mat. '95, p. 158-170

Compass: Fielding, J. Nucl. Mat. '01, p. 859

PBX-M: Kaye, PPCF '94, p. A51

TdeV: Decoste, PoP 1994, p. 1497

Inner Wall Bias Experiment



Machine condition:

Standard OH plasma
in SN or DN with
center stack voltage
biased at ≈ -100 VDC

- Bias inner wall to draw ion saturation current @ $V \approx -100$ VDC, expect ion current to be large fraction of loss to inner wall (total ion loss to wall $\Gamma \approx n(\text{vol})/\tau_p \approx 10^{22}$ ions/sec ≈ 1 kA)
- Single null configuration could create poloidal electric field which may make ion flow along field lines at \approx sound speed, and maybe radial flow $v_{\text{rad}} = E_{\text{pol}}/B \approx V/2qRB \approx 3$ cm/msec, which might control inner wall “gas puff” or ICRF coupling
- Double null configuration could create radial electric field which may make poloidal flow $v_{\text{pol}} = E_{\text{rad}}/B \approx V/\delta \approx 10^6$ cm/sec at $\delta = 3$ cm, which could make $\omega_{\text{shear}} > \omega_{\text{turb}} \approx 10^5$ sec $^{-1}$
- Measure: edge profiles, edge turbulence and edge MHD, power and particle flow, recycling and impurity influx, H-mode threshold, edge rotation, edge current profile, etc.

Other Biasing Ideas for NSTX

- Measure edge current penetration and/or edge rotation to gain information useful for CHI experiments with OH current
- Drive edge currents parallel to B which might affect edge MHD stability, e.g. of external kinks or EMPs
- Drive non-axisymmetric edge currents with biased tiles which could control edge MHD stability w/wo feedback
- Control particle / heat flow to divertor plates, e.g. to change location of strike points
- Drive high frequency AC bias ($\approx 1-10$ kHz) to control zonal flows in edge turbulence
- Mirnov's idea for driving currents by AC bias on limiter