Simulation of NSTX Plasmas with the UEDGE Code

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NSTX
5 year plan workshop
June 24-25, 2002

Features of the UEDGE transport code

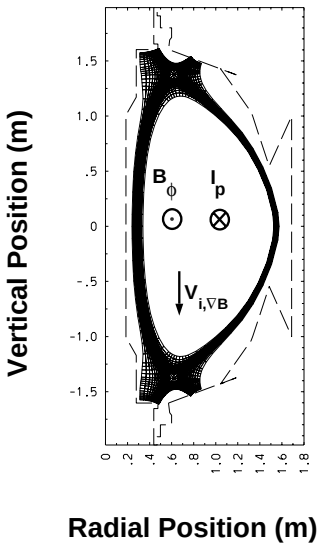
- Simulates particle and energy flow in the edge/SOL region using fluid transport equations
  - solve for n,v,T and ϕ
  - parallel transport classical
  - radial transport anomalous (from turbulence)
  - include classical cross-field drifts

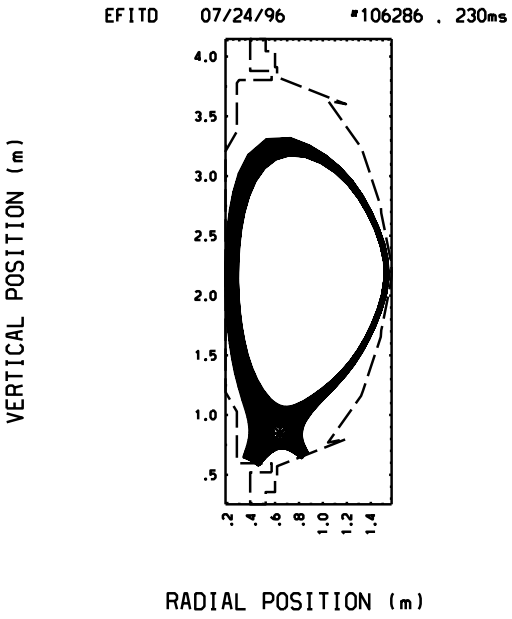
- Flexible geometric configurations
  - single-null
  - double-null
  - limiter
  - non-orthogonal mesh

- Numerics
  - finite-volume discretization
  - fully-implicit Newton solvers
  - steady-state solutions, or
  - time-dependent solutions to assess stability

- Special features
  - multi-species impurities
  - various neutrals models (fluid and MC)

UEDGE simulates both single-null and double-null configurations in NSTX



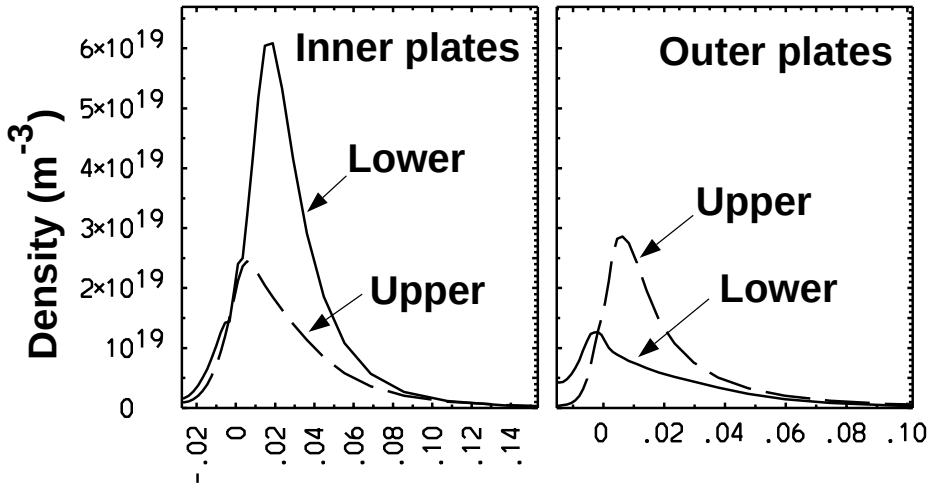


Double-null plasmas exhibit up/down asymmetries due to cross-field drifts

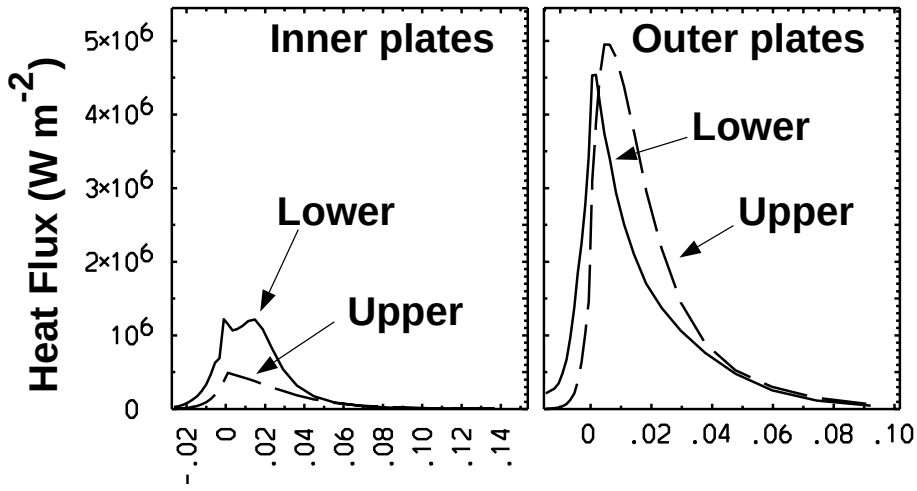
NSTX Reference Simulation:

P = 1.5 MW **B = - 0.3 T**

n = 3 x 10^{19} m^{-3} **I = 1.0 MA**

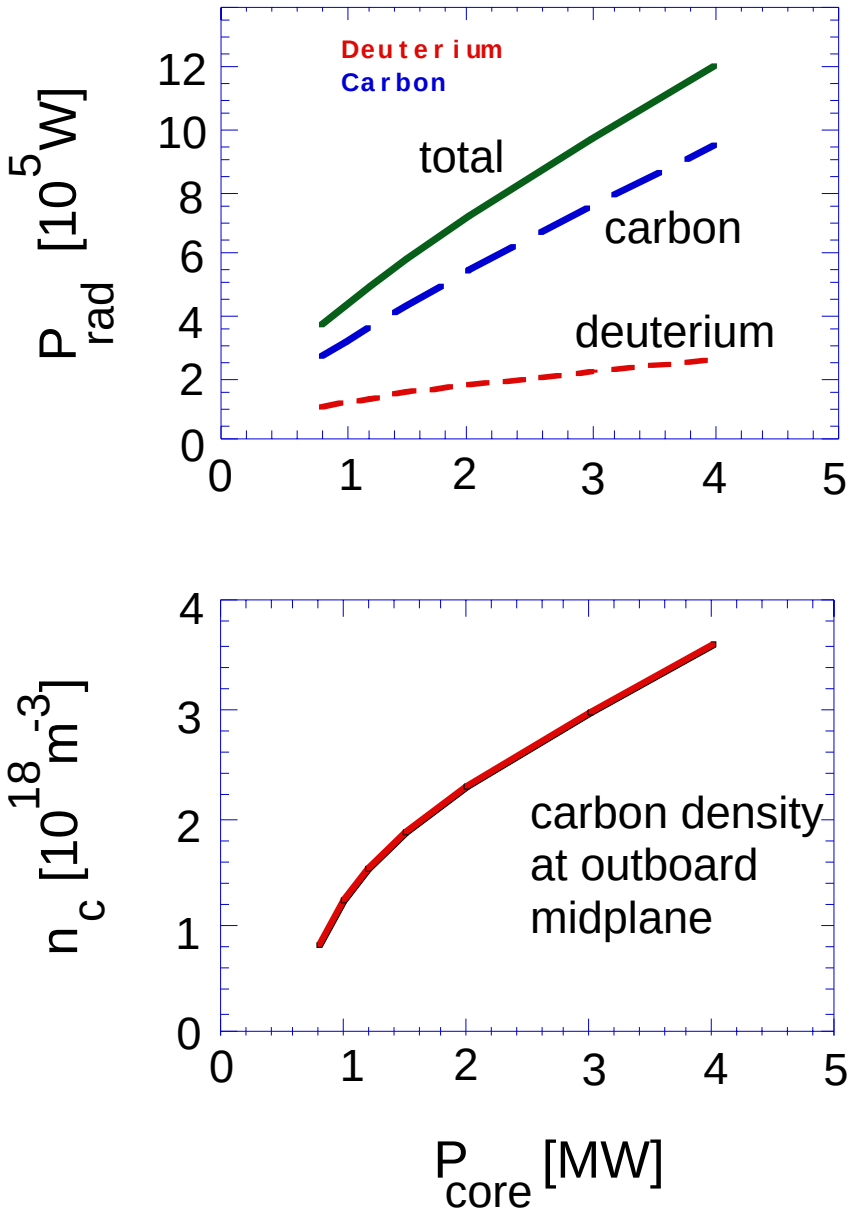


Divertor Plate Density



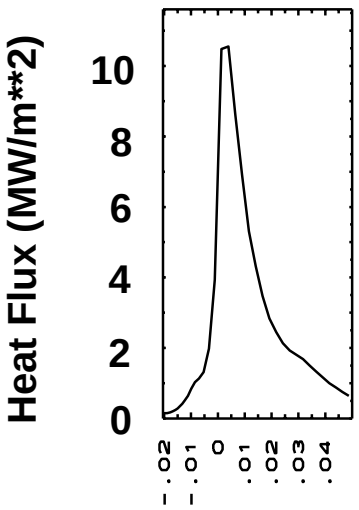
Divertor Plate Heat Flux

Radiation losses due to sputtered carbon increase with core input power

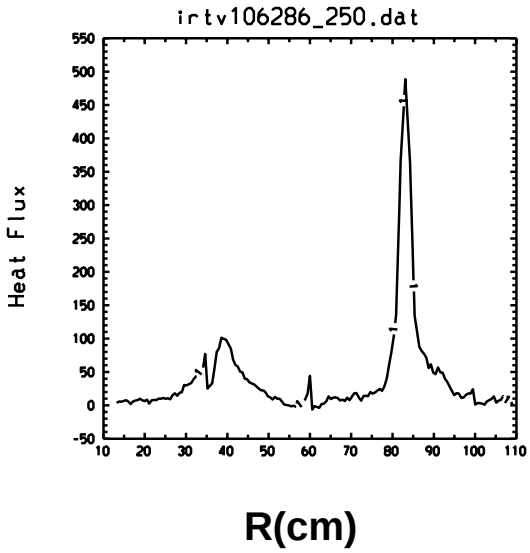


Heat flux profile measurements can provide a benchmark for simulations of single-null plasmas in NSTX

UEDGE simulation

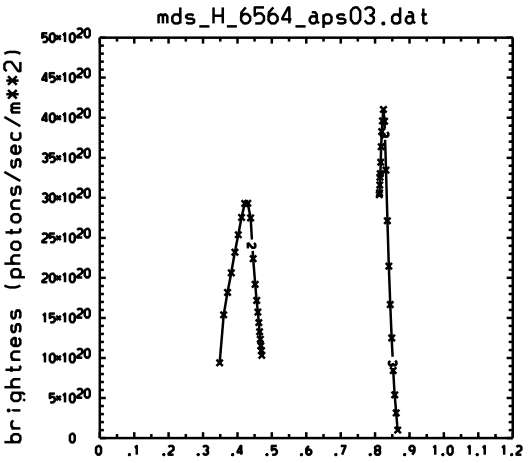


IRTV data



H-alpha measurements can provide a benchmark for simulations of single-null plasmas in NSTX

UEDGE simulation



Experiment