First SOLPS-ITER simulations of EAST with drifts

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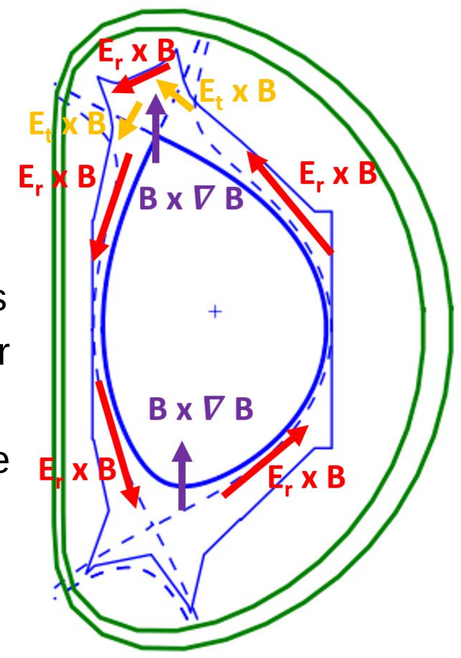
SOLPS-ITER

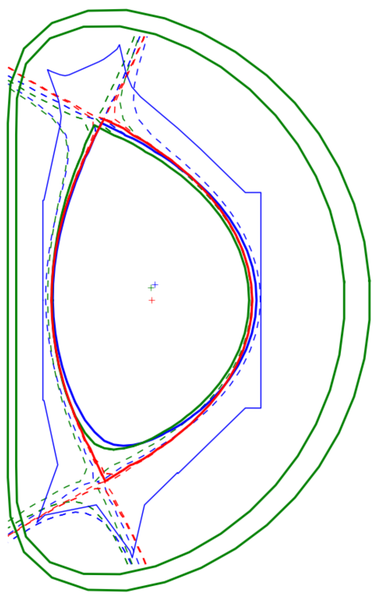
- Tool to model scrape-off layer (SOL) plasma
- Combination of B2.5 and EIRENE
  - B2.5: 2D multi-fluid plasma transport code which solves the Braginskii equations using finite volumes
  - EIRENE: kinetic neutral particle Monte Carlo code providing the source terms in the Braginskii equations
- Goal of using SOLPS-ITER: study if simplified analytical models for power scrape-off width as the drift-based Goldston scaling [1] can be used in DN configuration
  - Running SOLPS-ITER with drifts in upper single null (USN) is first step

Importance of drifts [2]

- ∇B-drift
  - Density in-out asymmetry
  - Change in core gradients
- ExB-drift
  - Change in power sharing of divertors
  - Redistribution of particles from outer to inner divertor
  - Redistribution of particles in the perpendicular direction into far SOL
  - Change in stagnation point

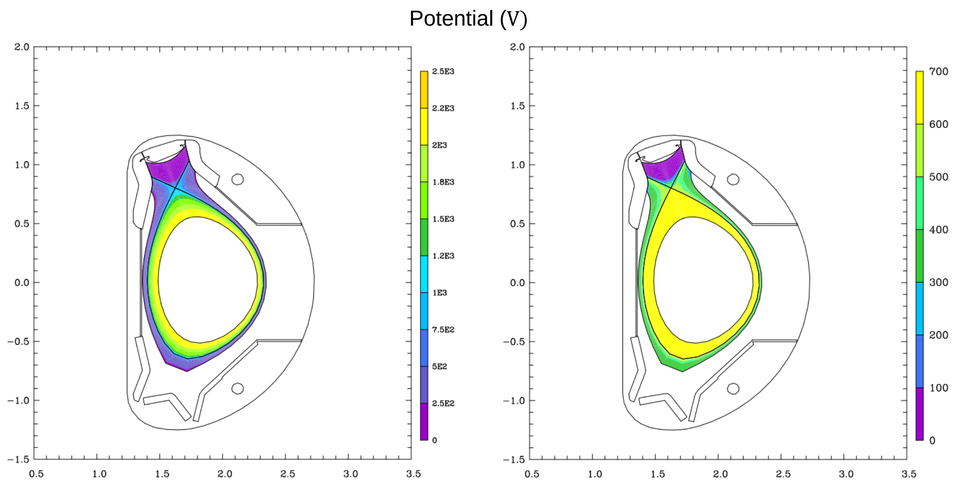


Studied equilibria EAST



- Upper Single Null (USN) configuration
- Disconnected Double Null with main upper divertor (DDN-up) configuration
- Double Null (DN) configuration

Importance of solving the potential equation



Potential equation not solved

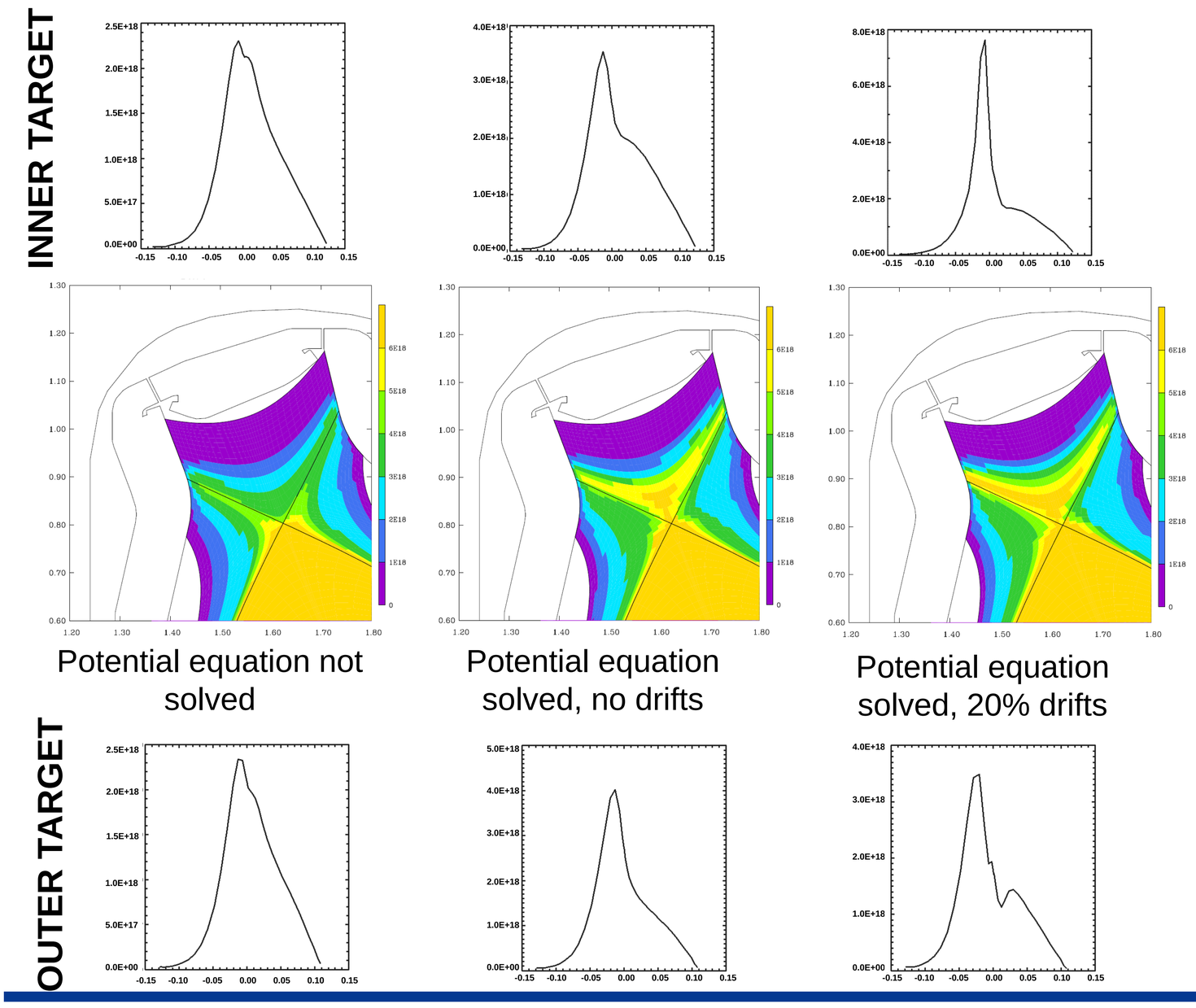
$E = 3{,}1\ T_e$

Potential equation solved

$\vec{j}_{||} = \overrightarrow{\sigma_{Sp.}} \times \vec{E}$ $\quad \vec{j}_{\perp} = \overrightarrow{\sigma_{an.}} \times \vec{E}$

First results of drift-cases

Electron density profiles (m^{-3})



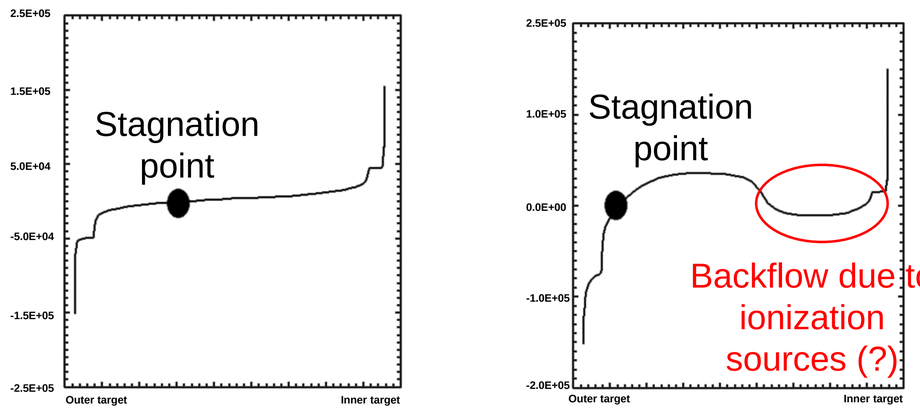
Potential equation not solved

Potential equation solved, no drifts

Potential equation solved, 20% drifts

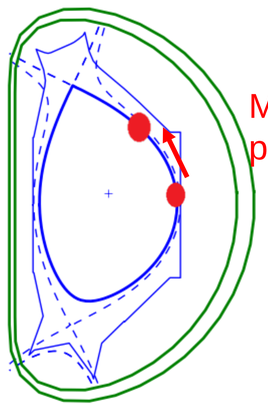
Change in stagnation point

Parallel velocity profiles along the separatrix



Potential equation solved, no drifts

Potential equation solved, 20% drifts



Movement of stagnation point due to drifts

References
[1] R.J. Goldston, J. Nucl. Fusion. 52 (2012) 013009
[2] F. Reimold, PSI, 2016

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