SOLPS-ITER / SONIC Benchmark

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Outline

Main goal and general overview

Grid sensitivity study

Preliminary comparison

Current status and future work

Main goal and general overview

➢ **SOLPS-ITER/SONIC benchmark with a step-wise approach**

Pure D with C wall (for reflection) → D + intrinsic C → D + intrinsic C + extrinsic Ar

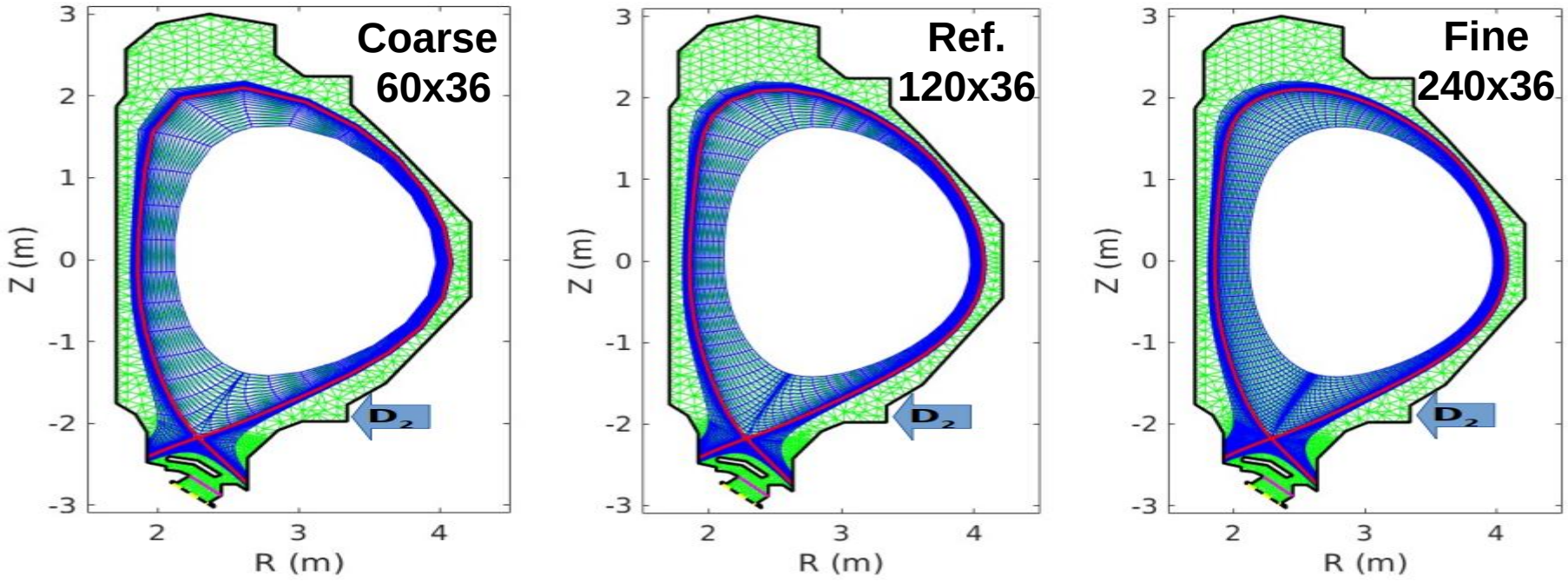
- Grid Sensitivy study 
- Partially detached and attached 
- Comparison 

Assessment of the effect of different impurity model 

JT-60SA scenario-like configuration

Grid sensitivity: discretization error

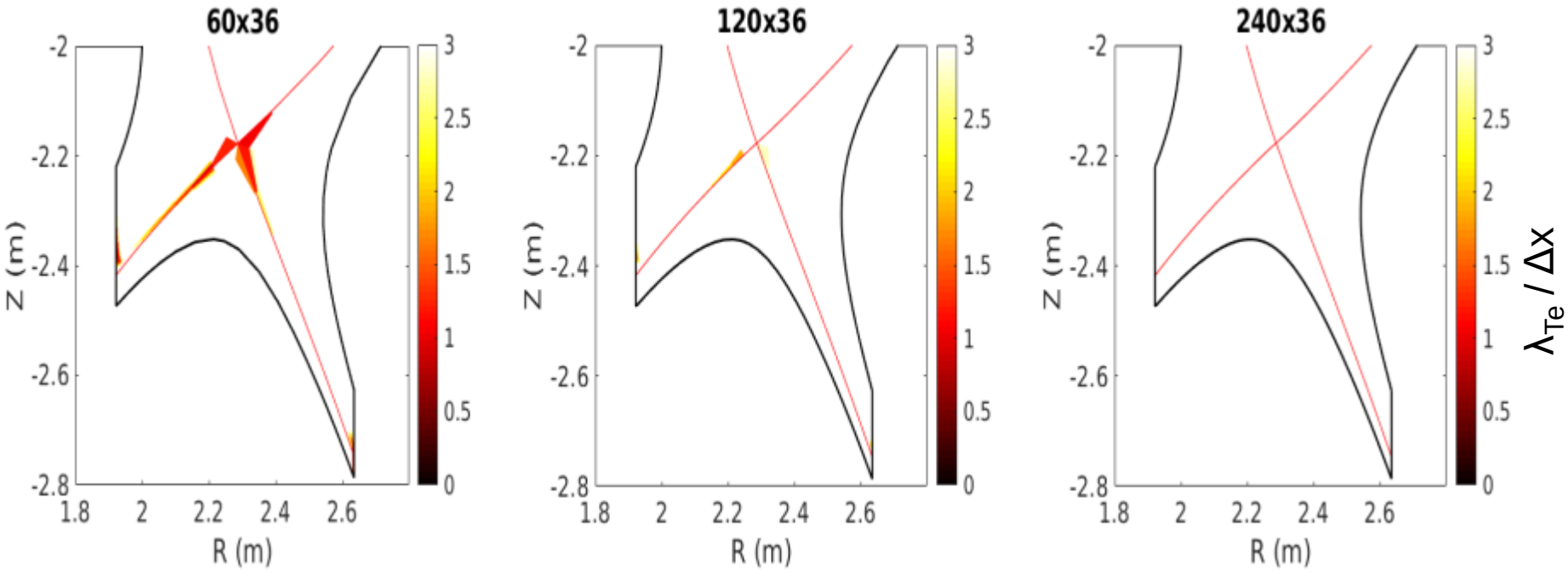
3 different poloidal resolutions taken into account



- P_{SOL} ~ 6MW and $n_{e,sep}$ ~ 2e19 m^{-3}
- Increase in the computational time (more than linearly) by increasing poloidal resolution
- Assessment of discretization error ε_{discr} [K. Ghoos et al 2019 Nucl. Fusion]

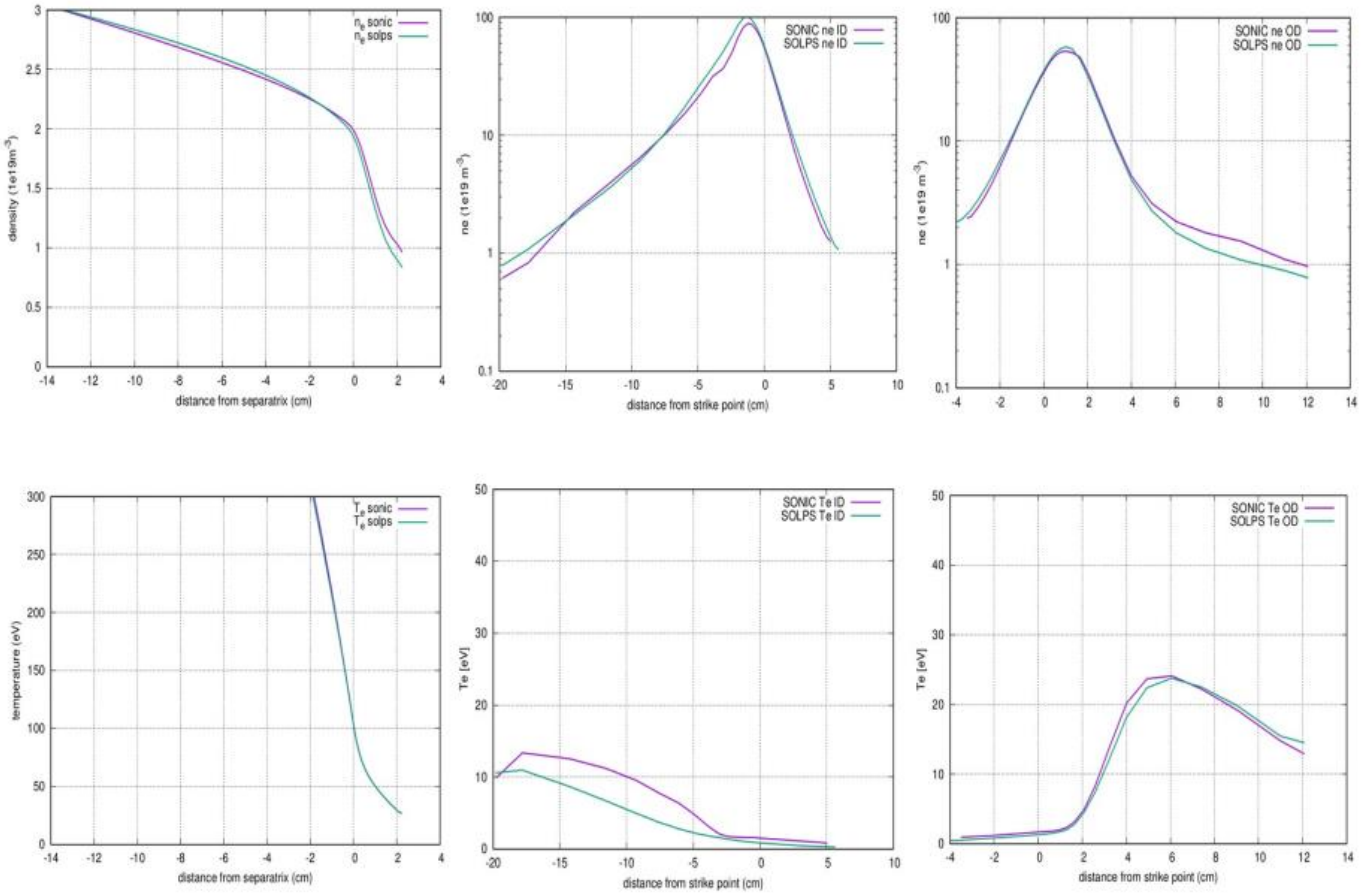
	Fluid neutral			EIRENE		
	Coarse	Ref.	Fine	Coarse	Ref.	Fine
ε_{discr}(%)	51.8	32.8	20.7	56.8	38.7	26.8

Grid sensitivity: resolution adequacy



- Assessment of the poloidal resolution to gradient ratio: λ_Φ / Δx, $\lambda_\Phi = |\Phi/\nabla\Phi|$
- Reference grid resolution suitable to describe poloidal gradient (λ_Φ / Δx > 2 in few cells along separatrix and close to inner target)
- **Trade-off** between the accuracy of the solution and the computational time

Preliminary comparison in pure D



- Comparison in pure D and partially detached
- Good agreement between SONIC and SOLPS-ITER
- **Close collaboration with QST team is necessary** for further investigation and assessment of the differences

Current status and future work

- Pure D comparison:
  - Attached plasma ($P_{SOL} \approx 30$ MW) converged ➡ **Waiting for SONIC results** to perform the comparison
  - Possible publication with results of Pure D comparison including initial grid sensitivity study

- D + intrinsic C
  - ✓ Definition and verification of the setup performed
  - ⏳ Simulations are ongoing
  - Definition of the numerical values (e.g. Y_{chem}) to use

- Future Plan
  - Compare pure D in both attached and detached cases with a deep insight the numerical results difference
  - Setup impurity seeded cases (Ar) in collaboration with QST team

Thank you
for your attention