



DSD-TSVV Jour Fixe: TSVV3 overview and plan

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In name of the TSVV3 team

DSD-TSVV Jour Fixe | 03/12/2024



This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 — EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

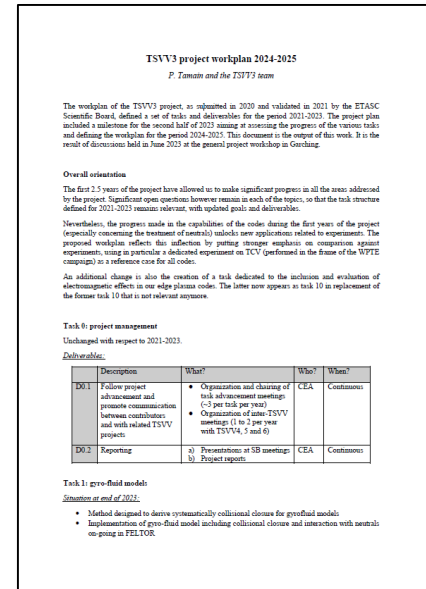
Extended workplan 2024-2025



❖ **Extended workplan for 2024-2025** defined at end of 2023 following discussions started at annual workshop and feedback of gate review

❖ 3 key axes:

- **Pursue existing development tasks** + 1 additional task on electromagnetic turbulence (high- β plasmas)
- **Apply recent progress to experiments and reactor relevant regimes:** TCVX23 (WPTe RT-05 experiment) as key-stone + selected applications to other machines (AUG, WEST, W7-AS)
- **Mutualize selected parts of models/codes**, starting with kinetic neutrals solvers



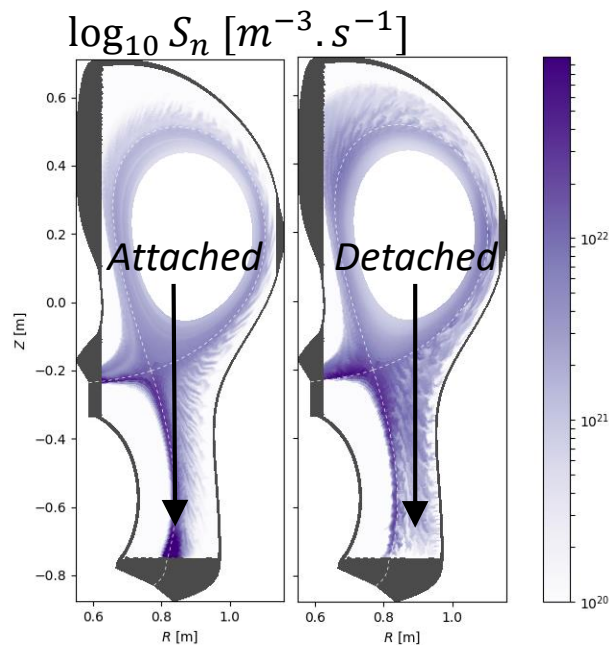
https://wiki.euro-fusion.org/images/c/ca/TSVV3_workplan_2024-2025.pdf

Tackling dissipative divertor regimes

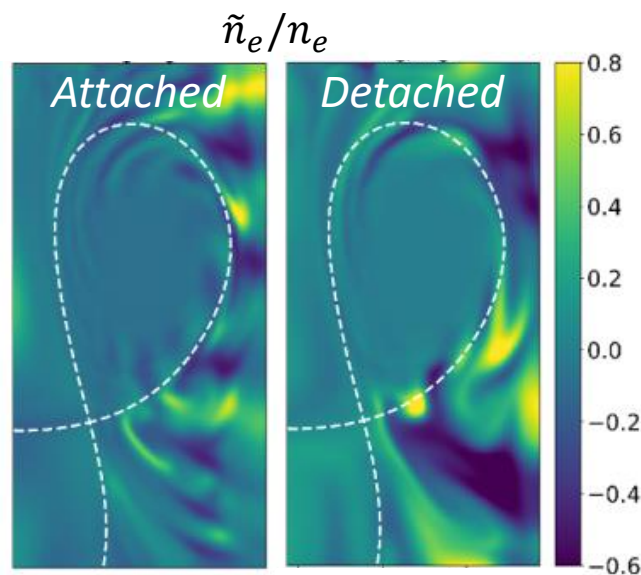


- ❖ First **turbulent simulations of highly dissipative divertor regimes** in support to **WPT-E** experiments demonstrate impact on turbulence

Detached divertor (TCV)

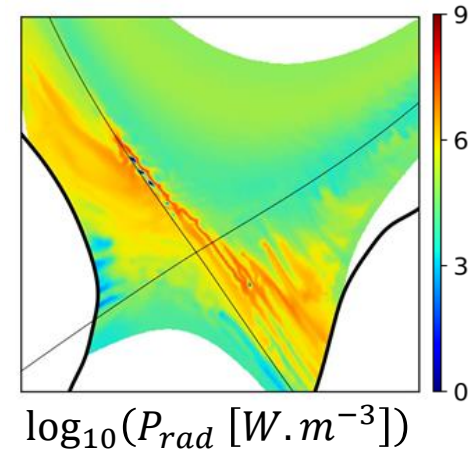


[Quadri, PSI conf. 2024;
submitted to NME]



[Mancini, PSI conf. 2024;
Mancini, NF 2023]

X-point radiator

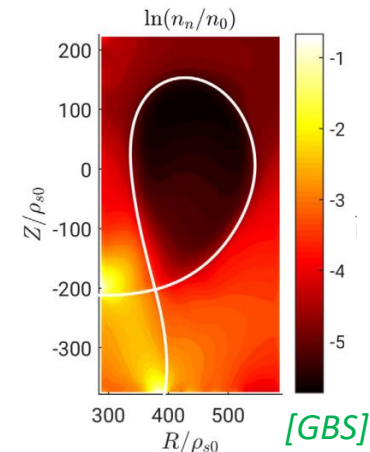
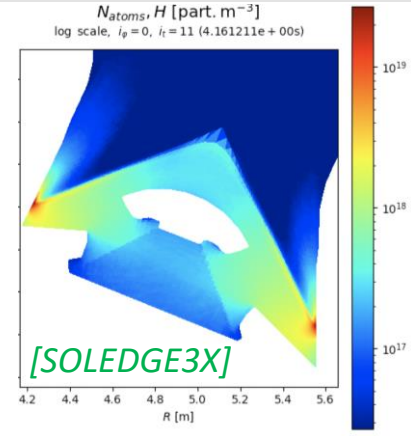


[Eder, PSI conf. 2024;
Eder, submitted to PPCF, pinboard
#38797]

Mutualization of tools



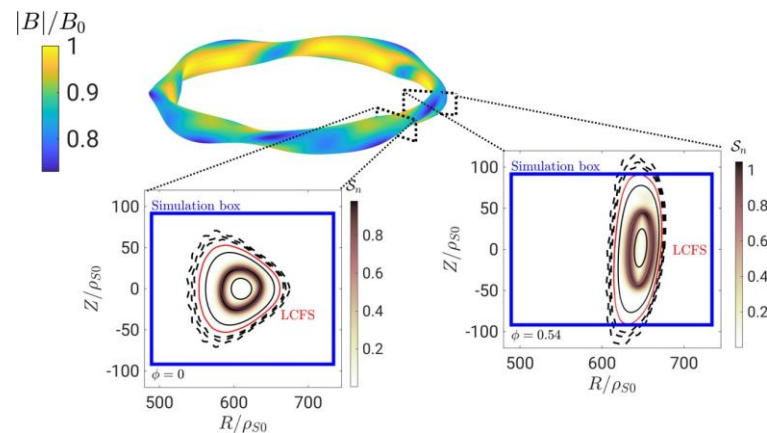
- ❖ **GBS** and **SOLEEDGE3X** already feature **kinetic neutrals solvers**
 - GBS = home-made, method of characteristics
 - SOLEEDGE3X = EIRENE
- ❖ Actions started to **modularize these solvers and make them available to other codes**
 - TSVV3 codes in priority, but could extend to other codes
- ❖ Working also on memory limit issue of coupling to EIRENE



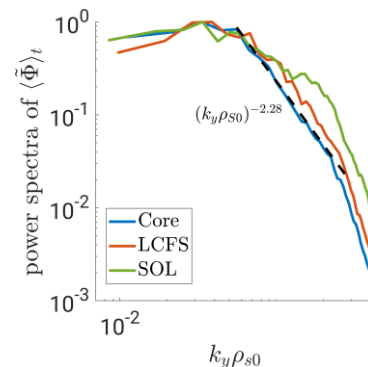
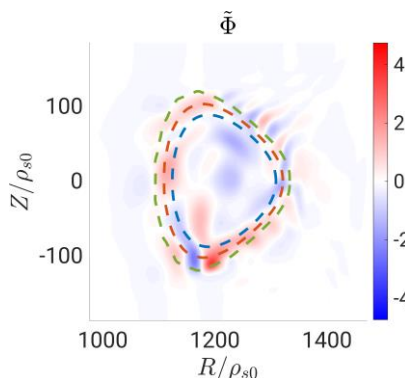
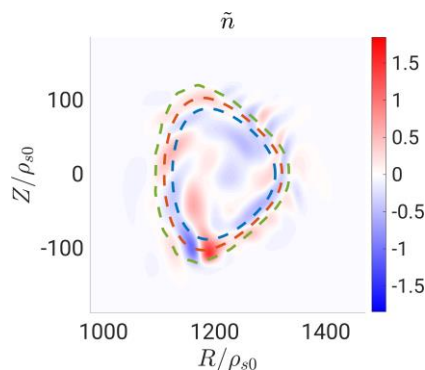
Stellarator turbulence towards experiments



- ❖ After proof of principle demonstrations in 2023, **stellarator turbulence** modelling moving towards large machines
 - **W7-AS** as intermediate step towards W7X
 - Here with GBS, GRILLIX joining soon
- ❖ First results in line qualitatively with experiments. WIP...



[courtesy Z. Tecchioli]



Perspectives for 2025 and beyond



- ❖ Carry on **upstream development of models and numerical methods** where remaining issues identified:
 - Sheath boundary conditions in trans-collisional conditions for MS plasmas
 - Reduced turbulence models (incl. implementation in SOLPS and SOLEDGE3X)
- ❖ Pursue **code acceleration**:
 - upscaling towards large scale machines (with ACH)
 - strategy to get 3D turbulence simulations to convergence in reasonable time
- ❖ Progressive **mutualization** of specific parts of codes:
 - E.g., kinetic neutrals solvers from GBS and SOLEDGE3X
- ❖ Progressively stronger focus on **confrontation to experiments** in relevant regimes in relation with WPTE:
 - **Detachment**: TCX23 experiment as reference case, also XPR on WEST / AUG, including development and usage of synthetic diagnostics based on IMAS
 - Confrontation to **stellarator** experiments (W7-AS then W7-X)
 - Propose key **recommandations** to mean-field community on transport model
 - Additional priorities to be discussed directly with WPTE at beginning of 2025
 - Tighten relations with TSVV5 concerning new needs for a kinetic neutrals solver (with TSSV1 and 4)