



Information to Thrust 2: Edge Physics and Plasma-Wall Interactions

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TSVV Task 5: Neutral Gas Dynamics in the Edge

- Development of a state-of-the-art neutral gas code towards optimal scalability on high-performance computing systems.
- Establishment of a multi-fidelity model hierarchy for the neutral gas phase in fusion devices; from first principles towards reduced models. Validation of the established models.
- Enabling model reduction and improved code-code coupling towards model integration (via IMAS). Provision of a neutral gas code as input to existing and future plasma boundary codes for ITER, W7-X, DEMO etc. (see TSVV Tasks 3 and 4).

TSVV Task 6: Impurity Sources, Transport, and Screening

- Establish an integrated modelling suite to predict the W impurity distribution in DEMO, including W source generation, W screening, W transport, W exhaust and its impact on the plasma performance.
- Develop 3D kinetic transport models for heavy impurities (including W) and seeding species like Ar, Kr, and Xe in the SOL and pedestal regions of DEMO.
- Assess the effects of 3D perturbations and ELM suppression techniques on the W impurity distribution in ITER reference scenarios, along with their implications for DEMO.

TSVV Task 7: Plasma-Wall Interaction in DEMO

- Establish an integrated modelling suite to predict steady-state PWI in DEMO.
- Provide safety-relevant information for DEMO reference scenarios concerning first-wall erosion, dust, and fuel inventory.
- Develop modelling capabilities to treat DEMO-relevant transients.

Involved WPs: WP PWIE, WP TE, WP SA, WP W7-X, WP PrIO, WP DES (DCT)

Participation of WP DES (DCT) for DEMO questions is essential and needs to be listed officially!

Summary: 1st Progress Meeting



Progress meeting: 30.8.2021

Link: <https://indico.euro-fusion.org/event/1306/>

Participation of key WP PL/DPL and all 3 PIs

- Kick-off of all 3 TSVVs successful
- Not all positions yet filled with personal (hiring ongoing / university contracts without “funding in 2021”)
- Moderate changes in human resources plan will be addressed the CO
- TSVV 5 reported on progress (IAEA NF paper about start-up phase)
- TSVV 6 and 7 reported on progress in the set-up of the project
- Open issues and questions identified => List of action items for Thrust facilitator

TSVV 5:

- Discussion about W7-X validation cases - embedded in the fluid code EMC3-EIRENE:
=> Meeting between TSVV 5 PI and WP W7X TFL to clarify cases required
- Discussion about validation cases for AUG - embedded in fluid codes SOLPS-ITER/EMC3-EIRENE as well as KU Leuven activities in corresponding RT in WP TE
=> Meeting between TSVV PI and WP TE TFL to clarify cases and scope

TSVV 6:

- Discussion with WP DIV (FTD) required => input for W divertor in W7-X (if possible)
- Joint meeting of TSVV 5 and 6 regarding coverage of kinetic ion module in EIRENE (neutrals vs. impurities, D+) required => PI meeting
- Ensure contact to EMC3-EIRENE developers at MPG when “updating” EMC3-EIRENE with UW Madison partners
- Need to clarify ACH support for 2022+ (was on lower side)

Summary: 1st Progress Meeting



TSVV 7:

- Discussion with WP DES/DCT (FTD) about DEMO plasma background required
=> Meeting of WP PWIE / DCT and TSVV PI required
- Experiment validation of parts of code suite in full-W device like AUG, WEST not yet considered
=> Meeting between TSVV PI and WP TE TFLs proposed
- Ensure contact to EMC3-EIRENE developers at MPG when “updating” EMC3-EIRENE with UW Madison partners
- Need to clarify ACH support for 2022+ (was on lower side)

WPs:

General:

- “Comparison with experiment” is a key issue => How can/will the TSVV “really” support WPs work in the area of WP PWIE and Edge? See Thrust 1 discussion.
- FTD persons with common interest in PWI & E needs to be invited for next thrust meetings regarding DEMO and beyond (e.g. WP DIV for SA and W7-X divertor)

WP W7X: Meeting with W7-X full-W PFC team with PIs to coordinate EUROfusion-supported activities started

WP TE: List of topics and ensure communication and participation in RT => TSVV PIs to contact RT

WP PWIE: Meeting to discuss TSVV 5 / 6 and ADC / TE work activities related to EIRENE