WP PWIE SP D kick-off meeting
VTT deliverable SP D.3.D005

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Task description from the PEP

Under SP D.3

D005: ERO simulations of AUG and JET-ILW erosion and migration experiments (including nitrogen, tungsten and beryllium) and comparison with experimental data (VTT)

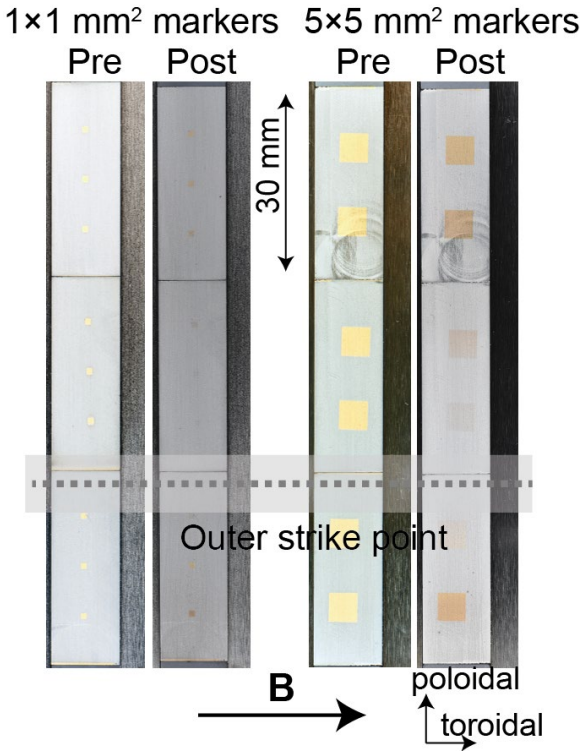
Corresponding tasks:

”ERO modelling for AUG erosion experiments - H mode in He, D (VTT)”

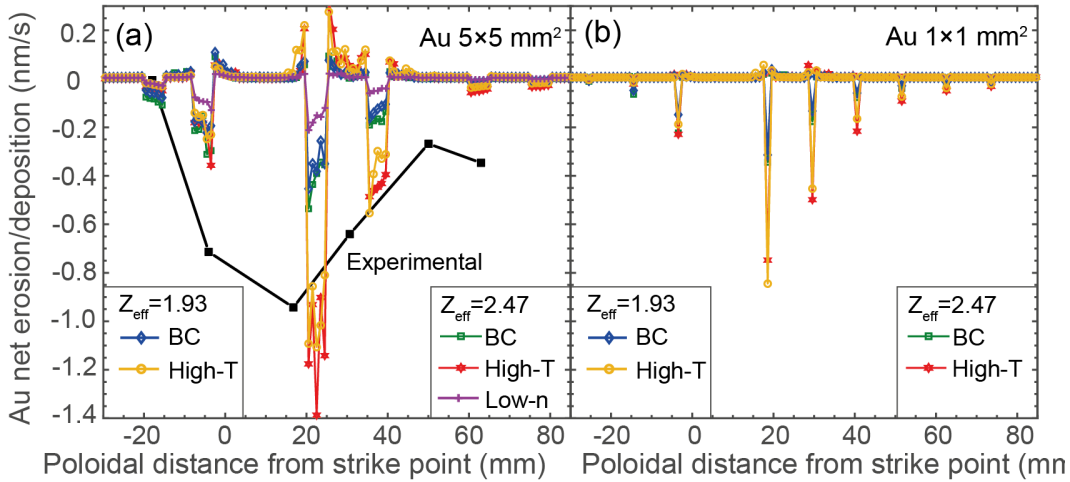
“Impurity migration modelling (N, W, Be) for JET-ILW and AUG (VTT)”

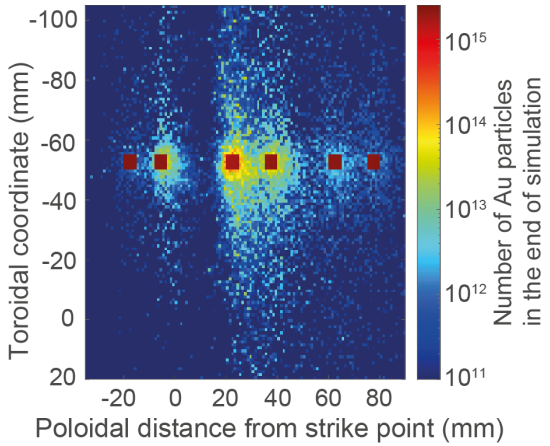
Essentially these are continuation of the work started in the FP8 era, with the focus put on H-mode and the inclusion of ELMs. In a mid-range timeframe these would include transition from ERO to ERO2.0 for the AUG tasks.

Overview of completed AUG work



- ERO simulations of Au marker spots exposed to high-T_e L-mode plasmas on AUG
- Comparison to experimental net-erosion profiles





- >70% of Au particles deposited close to the markers but toroidal tail clearly visible

- Predicted maximum net erosion consistent with measurement results
- Largest effect due to electron temperature
- Net deposition peaks mainly induced by E×B drift
- Effect of impurities only noticeable as T_e<20 eV

A. Hakola et al., NME 2020

Plans for 2021

Implementation of the work plan **pending for hiring new personnel at VTT**

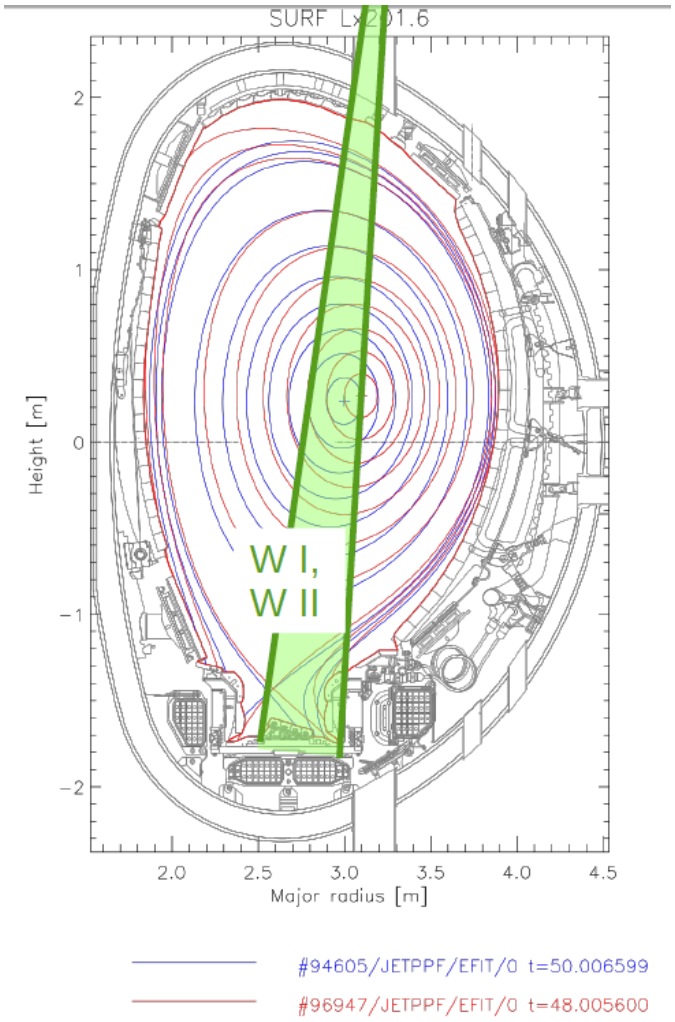
→ Could only be started once **positive national funding decision obtained in late May**

→ Recruitment process to be initiated in the autumn (at the earliest)

If and when the administrative issues are settled, the work itself would be

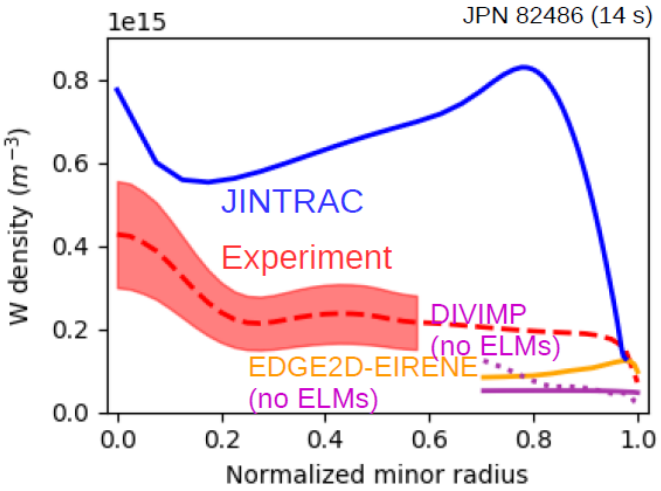
- **Continuing L-mode simulations** with the open issues identified in PSI 2020
  - ✓ Using a finer simulation grid than the 1 mm spacing applied now → re-deposition may show a relatively sharp profile
  - ✓ Re-running the simulations with corrected OSM backgrounds and with SOLPS-ITER backgrouns
  - ✓ Checking the validity of the T_i=T_e assumption, possible strong re-deposition of Mo etc.
- **Switching to H-mode experiments** (similar marker samples, H-mode with large type-I ELMs) from which the experimental data has recently become available
  - ✓ Applying the tools/ideas that have been applied to JET-ILW (see next slides)
  - ✓ Switching to ERO2.0

Overview of completed JET-ILW work



NB! Close links to **the TSVV6 Task**

- **Goal:** validate the ability of edge transport codes to predict the W erosion and influx
- Start from the measured W I and W II emission and core W concentrations in JET-ILW
- **Tools:** JINTRAC, DIVIMP, EDGE2D-EIRENE
- Predicted **ELMy H-mode W density within a factor of 2 in the core, factor of 3-4 at the pedestal**
- W sources dominated by intra-ELM sputtering by D^+, very sensitive to ELM parameters and imposed edge transport barrier



Plans for 2021

Work plan will be tightly linked to TSVV6, yet addressing aspects **directly connected to the specific JET-ILW experiments**:

- ERO2.0 simulations of **nitrogen molecular break-up and transport** in the JET-ILW divertor (R. Mäenpää M.Sc. thesis, 2021)
  - ✓ N^{1+} density decreases by 25% and N^{2+} density increases by 50% when N recycling changed from atoms to molecules in partially detached JET L-mode
- Modelling (and validation) of **W erosion and core W density predictions** in JET-ILW using JINTRAC and ERO2.0
  - ✓ ELMy H-mode scenarios (e.g. **M18-18**), D and D-T, **drifts included** in the inter-ELM background plasmas
  - ✓ ERO2.0 test runs in progress, production runs waiting for final JINTRAC backgrounds
  - ✓ Special focus in PWIE is on the **role of drifts on W erosion and migration/transport**