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| **WPPWIE Deliverables Status Report** | | | | | **Date:** | | | 01-Sep-2022 | | |
| **Subproject:** | SP B / Experiments on erosion, deposition and material migration | | | | **Deliverable ID** | | | PWIE-SP B.2.T-T002-D002 | | |
| **Deliverable owner:** | S. Markelj (JSI) | | | | **Deliverable due date** | | | 31-12-2022 | | |
| **WP Leader:**  **SP Coordinator:** | S. Brezinsek (FZJ)  J.W. Coenen (FZJ) | | | |  | | |  | | |
| **Task title:** | SP B.2 Material migration in toroidal devices | | | | | | | | | |
| **Deliverable title:** | Erosion and re-deposition rates as a function of surface roughness/morphology changes in controlled L- and H-mode plasma experiments (JSI) | | | | | | | | | |
| **Status:** |  | **Completed** |  | **Partially completed** | |  | **Delayed** | |  | **Cancelled** |
| Please write a short status report (max. ½ pages) here.  Please check the status of the deliverable(s) with a “x” in the row above.  If the deliverable(s) are delayed, please also indicate an estimated completion date in the report text.  If the deliverable(s) include machine time, please indicate the number of days that have been used for the deliverable(s) in the report text.  For reference, the specification of this task from the PMP is given below. | | | | | | | | | | |
| **Reference from PMP:** | | | | | | | | | | |
| Material migration, both resulting from erosion of plasma-facing components and of plasma impurities, will be investigated in selected, ITER- and DEMO-relevant experiments in the EUROfusion tokamaks, in particular in ASDEX Upgrade and WEST, as well as in the W7-X stellarator. The main tools will be exposure of samples with marker layers or injection of tracer elements into the fusion plasma during a series of pre-determined plasma discharges. The experiments will be done in collaboration with WP TE and WP W7X or internal programmes of the involved machines. The role of WP PWIE is to procure materials or produce marker samples for the experiments, make the necessary pre- and post-exposure characterisation of samples, as well as provide data on component erosion, migration patterns of the different elements, and composition of re-deposited layers for modelling efforts under SP D. At the focus will be identifying the balance between gross and net erosion of W in fusion plasmas, migration of W and impurities like N, Ne, Ar in the SOL, and investigating the properties of re-deposited W layers with respect to virgin W components. Work related to JET-ILW will be done in SP D (modelling) and SP E (surface analyses). The studies include using isotopes such as 13C or 15N. | | | | | | | | | | |
| **Inputs required:**   * Experimental programme for plasma experiments in WP TE * Availability of erosion/migration samples for analyses - jointly with WP TE, WP W7X, and AUG, WEST, and W7-X teams * Plasma background and erosion/migration modelling results from SP D | | | | | | | | | | |
| **Tasks to be performed:**   * Determine erosion, re-deposition, and fuel-retention patterns on WEST PFUs after C3, C4, and C5 campaigns: project coordination and surface analyses, including melting patterns for SP A (CEA) * Determine influence of surface morphology on erosion and re-deposition patterns of marker samples and coatings (AUG, WEST): project coordination as well as broad-beam and microbeam RBS/NRA (JSI) * Determine gross and net erosion of marker samples and coatings (AUG, WEST) and migration of impurities in edge plasmas (AUG, WEST, W7-X): project coordination and surface analyses (VTT) * Coordinate erosion and migration experiments and related surface analyses on W7-X; perform surface analyses for erosion/deposition, fuel-retention, and surface-modification patterns (incl. melting patterns for SP A) on samples from AUG, WEST, and W7-X (FZJ). * Coordinate erosion and migration experiments and related surface analyses on AUG and perform surface analyses for erosion/deposition, fuel-retention, and surface-modification patterns (incl. melting patterns for SP A) on samples from AUG (MPG) * Perform surface analyses for erosion/deposition, fuel-retention, and surface-modification patterns on samples from W7-X (MPG) * Perform surface analyses for erosion/deposition, fuel-retention, and surface-modification patterns on samples from WEST (MPG) * Perform detailed surface analyses for fuel-retention and impurity-deposition patterns on marker samples and other samples from specific plasma experiments (WEST, W7-X) (VR) * Microscopy studies of marker samples and other samples from specific plasma experiments (WEST, W7-X) (IPPLM)   Ion-beam measurements (broad-beam and microbeam) of marker samples and other samples from specific plasma experiments (AUG, WEST, W7-X), comparison to linear devices and lab experiments (RBI) | | | | | | | | | | |
| **Deliverables:**   |  |  | | --- | --- | | **Deliverable ID:** | **Deliverable Title:** | | D001 | Erosion, re-deposition, and fuel-retention patterns on selected WEST PFUs after C3, C4, and C5 campaigns (CEA) | | D002 | Erosion and re-deposition rates as a function of surface roughness/morphology changes in controlled L- and H-mode plasma experiments (JSI) | | D003 | Balance between gross and net erosion of plasma-facing materials in controlled L- and H-mode plasma experiments (VTT) | | D004 | NRA, SEM, and FIB characterization of marker samples and coatings from selected plasma experiments on AUG, WEST, and W7-X with conclusions (FZJ) | | D005 | RBS, NRA, SEM, and CLSM characterization of marker samples and coatings from selected plasma experiments on AUG with conclusions (MPG) | | D006 | RBS, NRA, SEM, and CLSM characterization of marker samples and coatings from selected plasma experiments on W7-X with conclusions (MPG) | | D007 | RBS, NRA, SEM, and CLSM characterization of marker samples and coatings from selected plasma experiments on WEST with conclusions (MPG) | | D008 | RBS, NRA, ERDA, and MEIS/LEIS characterization of marker samples and coatings from selected plasma experiments on WEST and W7-X with conclusions (VR) | | D009 | SEM, TEM and FIB characterization of selected samples from experiments on WEST and W7-X with conclusions (IPPLM) | | D010 | ERDA, RBS, NRA and PIXE characterization of selected samples from experiments on AUG, WEST, and W7-X as well from laboratory and linear plasma experiments (RBI) | | D011 | SEM, TEM and FIB characterization of selected samples from experiments on AUG, WEST, and W7-X (IPPLM) (Transfer 2021) | | | | | | | | | | | |
| **Management Information**  **Human Resources (2022):**   |  |  |  |  | | --- | --- | --- | --- | | **Deliverable Owner** | **Beneficiary** | **PM** | **Deliverable (Team)** | | M. Diez | CEA | 2 | D001 (T. Angot, R. Bisson, M. Diez, G. Giacometti, C. Martin, M. Minissale, C. Pardanaud) | | S. Markelj | JSI | 3 | D002 (M. Kelemen, S. Markelj, E. Punzon-Quijorna, P. Pelicon) | | A. Hakola | VTT | 2 | D003 (A. Hakola, P. Jalkanen, J. Likonen, K. Mizohata, T. Vuoriheimo) | | M. Rasinski | FZJ | 2 | D004 (T. Dittmar, J. Oelmann, M. Rasinski, G. Sergienko) | | K. Krieger | MPG | 2 | D005 (M. Balden, S. Elgeti, K. Hunger, W. Jacob, K. Krieger, M. Mayer) | | M. Mayer | MPG | 2 | D006 (M. Balden, C. P. Dhard, S. Elgeti, K. Hunger, W. Jacob, K. Krieger, M. Mayer) | | M. Balden | MPG | 2 | D007 (M. Balden, S. Elgeti, K. Hunger, W. Jacob, K. Krieger, M. Mayer) | | P. Petersson | VR | 2 | D008 (L. Dittrich, M. Moro, P. Petersson, D. Primetzhofer, M. Rubel, J. Shams-Latifi, P. Ström) | | E. Fortuna-Zalesna | IPPLM | 2+2 | D009, D011 (P. Bazarnik, E. Fortuna-Zalesna, T. Plocinski, M. Spychalski, S. Szpilewicz, J. Zdunek, W. Zielinski) | | I. Bogdanovic Radovic | RBI | 3 | D010 (I. Bogdanović Radović, S. Fazinić, Z. Siketić, T. Tadić) | | **Total** |  | **24** |  |   **Machine Resources (2022):**   |  |  |  |  | | --- | --- | --- | --- | | **Device** | **Beneficiary** | **Days** | **Related Deliverable** | | Accelerator | FZJ | 3 | D004 | | Accelerator | JSI | 5 | D002 | | Accelerator | MPG | 8 | D005, D006, D007 | | Accelerator | RBI | 7 | D010 | | Accelerator | VR | 5 | D008 | | Accelerator | VTT | 1 | D003 | |  |  |  |  |   **Other resources:**  **Collaborations:**   * WPTE (AUG, WEST; including internal programmes) * WPW7X * ITPA DivSOL   **Other information:**  Connected to TSVVs associated with WPPWIE | | | | | | | | | | |