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| **WPPWIE Deliverables Status Report** | | | | | **Date:** | | | 01-Sep-2022 | | |
| **Subproject:** | SP X / Plasma characterization, laser-  based diagnostic development, and wall conditioning | | | | **Deliverable ID** | | | PWIE-SP X.1.T-T002-D001 | | |
| **Deliverable owner:** | H. van der Meiden (DIFFER) | | | | **Deliverable due date** | | | 31-12-2022 | | |
| **WP Leader:**  **SP Coordinator:** | S. Brezinsek (FZJ)  H. J. van der Meiden (DIFFER) | | | |  | | |  | | |
| **Task title:** | SP X.1 Atomic and molecular processes in attached/detached plasma and sheath | | | | | | | | | |
| **Deliverable title:** | MAGNUM-PSI/UPP: TALIF system, conceptional CARS/SARS system for ro-vib. ground state distribution H2, VUV OES results H/H2 and Plasma characterization (TS and/or CTS) (DIFFER) | | | | | | | | | |
| **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:** | | | | | | | | | | |
| This subproject involves in particular the determination of the distribution of the ro-vibrationally excited states of H2 and its isotopologues, in the electronic ground state as well as in electronic excited states in the plasma volume as well as in front of different first wall material surfaces. Moreover, the interplay of atomic and molecular species – including seeding species – during the detachment and recombination process will be investigated and compared with corresponding collision-radiative models from TSVVs.  The plasma-neutral coupling plays a major role in the necessary plasma energy dissipation and momentum loss in the scrape-off layer of the divertor. The second aim is the investigation of the processes occurring in the vicinity of plasma-facing surfaces, where the sheath is the last barrier that determines the power load to the surface in terms of particle flux, sheath heat transmission and e-i and i-n friction (diffusive sheath). Active (e.g. LIF, CARS) and passive spectroscopy (OES and VUV) combined potentially with TS/CTS and Langmuir probes will be deployed to investigate the involved processes and underlying mechanisms with high accuracy and spatial resolution. Linear plasma devices that produce hydrogen and deuterium plasma, are proposed here as first testbed, application in toroidal devices will take place in WPTE and WPW7X. | | | | | | | | | | |
| **Inputs required:**   * Linear devices: MAGNUM-PSI, UPP, PSI-2   VUV LIF diagnostics (dye laser etc. ) and VUV compatible passive spectroscopy systems | | | | | | | | | | |
| **Tasks to be performed:**   * Measurement of the atomic density of H(1s) and isotopes: installation TALIF in MAGNUM-PSI. Final design CARS/SARS system for ro-vibrational ground state distribution H2 in MAGNUM (DIFFER) * VUV passive spectroscopy on H/H2 and isotopes in MAGNUM-PSI (FZJ, DIFFER, CU) * Final design LIF in PSI-2 to measure ro-vibrational ground state distribution (FZJ) * VUV passive spectroscopy on H/H2 in PSI-2 (FZJ, CU, DIFFER) * Feasibility study multi-photon LIF to measure ro-vibrational ground state distribution of H2 and isotopes (DCU) * Measure ion/electron properties in the proximity of the target surface (Magnum (ion/electron), PUP (electron)) for accurate power load estimations (DIFFER)   Remark: tasks related to LIF concerns mainly diagnostic design and development | | | | | | | | | | |
| **Deliverables:**   |  |  | | --- | --- | | **Deliverable ID** | **Deliverable Title** | | D001 | MAGNUM-PSI/UPP: TALIF system, conceptional CARS/SARS system for ro-vib. ground state distribution H2, VUV OES results H/H2 and Plasma characterization (TS and/or CTS) (DIFFER) | | D002 | PSI-2: VUV OES results H/H2, Conceptional design LIF for H/H2 and W measurements (FZJ) | | D003 | VUV OES results H/H2 (CU) | | D004 | Results feasibility multi-photon LIF for ro-vib. ground state distribution H2(v,J) (DCU) | | D005 | Results feasibility multi-photon LIF for ro-vib. ground state distribution H2(v,J) (DCU) (Transfer 2021) | | | | | | | | | | | |
| **Management Information**  **Human Resources (2022)**:   |  |  |  |  | | --- | --- | --- | --- | | **Deliverable Owner** | **Beneficiary** | **PM** | **Deliverable (Team)** | | H. van der Meiden | DIFFER | 6 | D001 (H. van der Meiden, I. Classen, J. van den Berg-Stolp …) | | M. Reinhart | FZJ | 2 | D002 (M. Reinhart, S. Ertmer, G. Sergienko,..) | | P. Veis | CU | 5 | D003 (J. Kristof, …) | | T. Gans | DCU | 3+3 | D004, D005 (T. Gans…) | | **Total** |  | 19 |  |   **Hardware/ Machine Resources: e.g. Materials / Linear devices type / days / HHF**   |  |  |  |  | | --- | --- | --- | --- | | **Device** | **Beneficiary** | **Days** | **Related Deliverable** | | MAGNUM-PSI | DIFFER | 5 | D001 | | UPP | DIFFER | 5 | D001 | | PSI-2 | FZJ | 5 | D002 | |  |  |  |  |   **Other resources:**  **Collaborations:**   * WPTE, WPW7X * EU-Japan (NAGDIS, LHD)   **Other information:**  Connected to TSVVs associated with WPPWIE | | | | | | | | | | |