



# TSVV11: Plasma Initiation Present status (2021/09/03)

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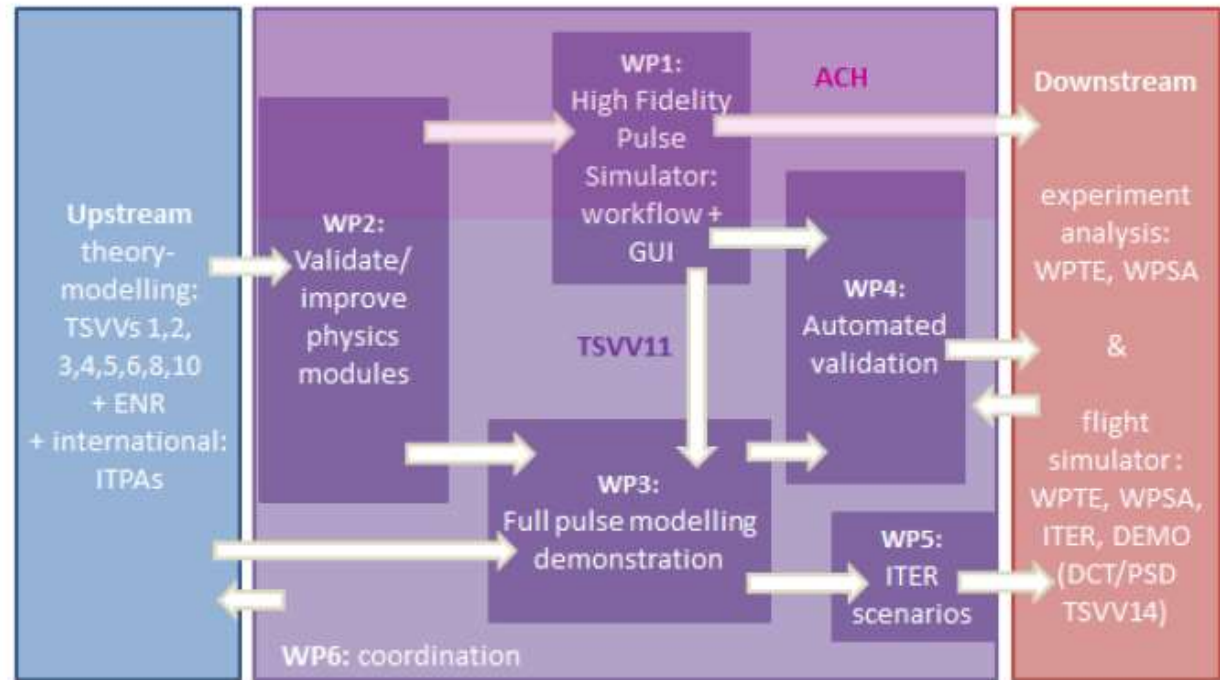


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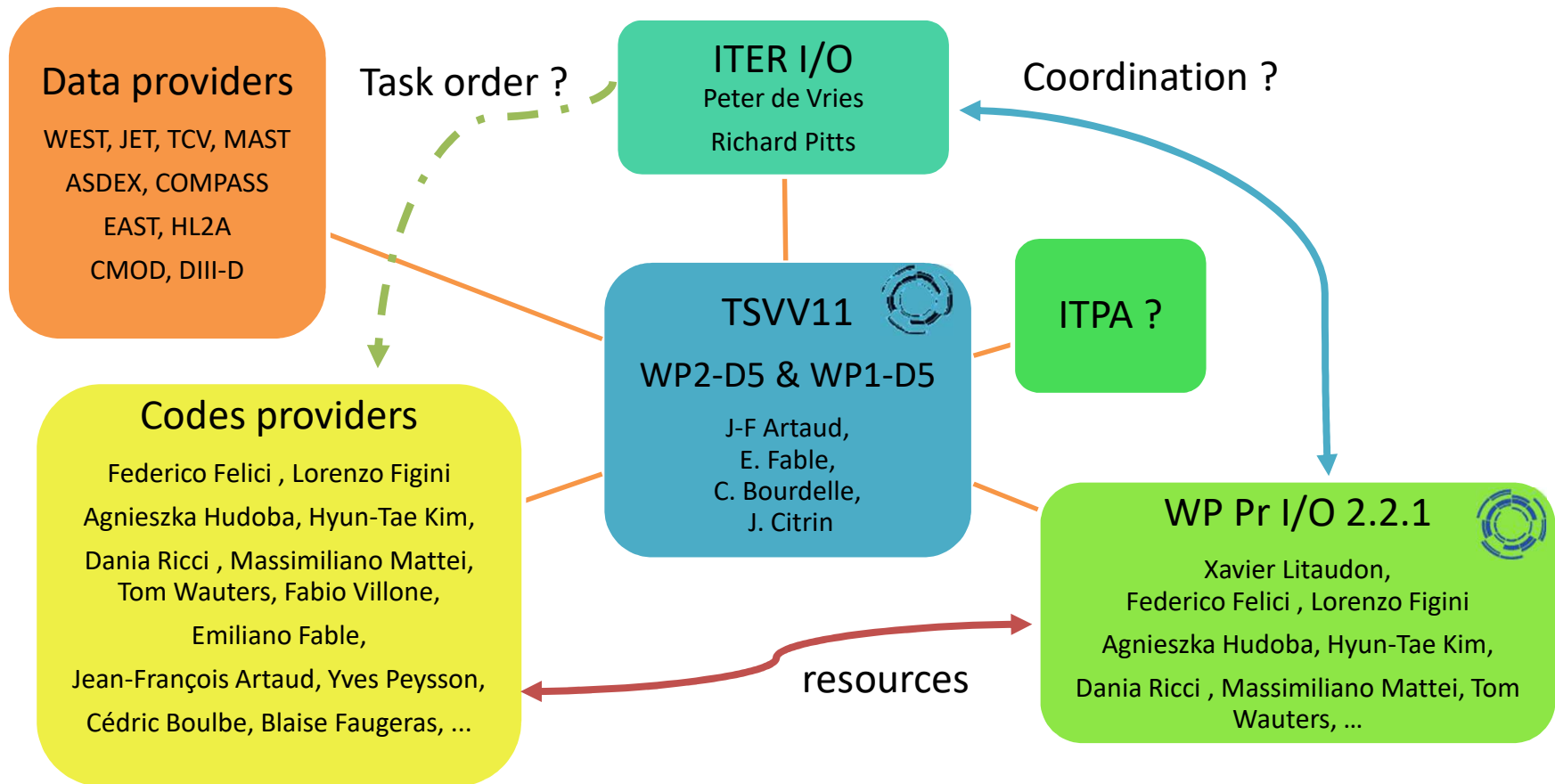
# TSVV11: bring most advanced physics models to the tokamak control rooms thanks to fast and reliable integrated modelling



- Align with ITER technical choices in terms of integrated modelling workflow and database management
- Improve and validate advanced physics modules focusing on high priority modelling extensions that will be needed for multi-physics full predictive modelling, with the help of other TSVV activities
- Demonstrate validation of full pulse predictive modelling from breakdown to termination, including a realistic assessment of operational limits
- Support extended validation against EU operating tokamaks by providing to users outside this TSVV yearly training on the integrated modelling workflow, a detailed and clear documentation on the workflow and the embedded physics modules, a user friendly interface and automated validation tools.



HFPSeu (high fidelity pulse simulator) is a IMAS version of JINTRAC initially developed for ITER chosen as the workhorse for integrated modeling within TSVV11



## Plasma initiation: tasks definition (in TSVV-11)



1. IMAS database for plasma initiation (2022)
2. Validation (against experimental data) of plasma initiation codes and workflow (FBE + plasma initiation code) in the IMAS framework (2023)
3. Validation (against experimental data) of plasma initiation codes and workflow (FBE + plasma initiation code) in the IMAS framework including plasma current ramp-up (2025)
4. Develop the procedure for the transition from plasma initiation to plasma ramp-up in the HFPSeu (needed for task 3)
5. Couple the burn through model with the free boundary code NICE (or other FBE) in HFPSeu with WP1 support (needed for task 2)



1. IMAS database for plasma initiation
  - Start to list data needed to run codes (DYON, MEQ, NICE, METIS, ToFu)
  - A list of WEST experiments (21) relevant for plasma initiation has been selected
  - WEST post processing is on way to be adapted to get data for plasma initiation phase
4. Develop the procedure for the transition from plasma initiation to plasma ramp-up in the HFPSeu.
  - Strategy in under definition
5. Couple the burn through model with the free boundary code NICE (or other FBE) in HFPSeu with WP1 support
  - Work has started for the coupling of DYON and NICE

## Plasma initiation: what next ?



- Fill IMAS data base optimized for plasma initiation with WEST data:
  - ✓ Optimized equilibrium reconstruction for low plasma current
  - ✓ Transfer WEST machine description to plasma initiation data base
  - ✓ Extract data for plasma initiation and ramp-up and copy it in plasma initiation data base.
- First test of the workflow coupling DYON and NICE
  - ✓ IMASify DYON: at the first stage this could just be the IDS exchange with the FBE code ?
  - ✓ Self consistent resolution of equations by integrating DYON equation and FBE equations in a IMAS framework ?
  - ✓ IMAS based user interface for the plasma initiation workflow with the BKD0 + GRAY + CREATE-BD under IMAS framework project ?
- Selection of a second machine for extension of IMAS data base dedicated to plasma initiation
  - ✓ JET, TCV or AUG ?
  - ✓ List of interesting shots ?



- ✓ Wiki pages are maintained up-to-date
  - TSVV-11 :  
<https://wiki.euro-fusion.org/wiki/TSVV-11>
  - WP2.D5 (plasma initiation):  
<https://wiki.euro-fusion.org/wiki/TSVV-11-WP2.D5>
  - WP1 (HFPSeu Workflow orchestration and module coupling framework):  
<https://wiki.euro-fusion.org/wiki/TSVV-11-WP1>