Activities related to the development of an Air Transfer System prototype and Cask Transfer System Virtual Mockup


**Partners:**
- Instituto Superior Técnico (IST), Portugal – Coordinator
- CIEMAT - Spain
- ASTRIUM ST (France) – subcontractor

**Tasks**
- **Task 1** – Definition of optimized CPRHS paths between all vessel ports on all levels and the hot cell ports (IST)
- **Task 2** – Definition, development and operation of a comprehensive Virtual Model of the ITER buildings, ATS and TCS (ASTRIUM ST)
- **Task 3** – Definition of a test facility for ATS prototyping testing (IST + CIEMAT)
- **Task 4** – Technical support in the task areas A and B (IST)
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- Results from Task 1 (IST):
  - Development of TES (Trajectory Evaluator and Simulator). MATLAB tool for:
    - Load, edit and save maps.
    - Evaluate, load, and save trajectories.
      - For the grant, TES was developed considering that both wheels of the CTS follow the same path. A different approach with both wheels following different trajectories can be developed in the future.
    - Simulate the CPRHS/CTS following the optimized paths.
    - Estimate the space occupied by the CPRHS/CT along the entire trajectory.
    - Drive manually the CPRHS/CTS with its rhombic capabilities.
    - Identify the nearest obstacle in each point of the trajectory.
    - Generate plots with velocities, orientations, minimum distances, etc.
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- Results from Task 1 (IST):
  - **Generation of Optimized Trajectories** (60 trajectories more than 4.5 km of length in ITER buildings (TB and HCB), some with 1 or 2 maneuvers for docking and parking). Some of the trajectories required one or two maneuvers.
Results from Task 1 (IST):

- Buildings CAD models analysis and proposal modifications (e.g., VV port cell doors modifications were proposed (door width, aperture angle, aperture direction) to guarantee a safety margin of 300mm in all trajectories)
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- **Results from Task 1 (IST):**
  - Extension of VV ports 8 and 17 in level L1 of the TB were proposed and included in all studies where this modification becomes relevant.
  
  ![Evolution of the minimum distance to the obstacles](image1)

  ![Extension of VV port cell 8 in level L1 of TB and closest obstacles associated to each part of the trajectory](image2)

  - Study on the **parking locations** in Hot Cell Building
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Results from Task 3 (IST + CIEMAT)

- Specification of a Test Facility for the CPRHS/CTS
- 1200m² with three main areas: CPRHS testing area + docking testing area + transfer testing area
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- **Results from Task 4 (IST):**
  - Technical consultancy support to F4E for CPRHS/CTS design. Main addressed topics: the CPRHS/CTS dimensions, CPRHS docking procedures, interfaces between the three components of the CPRHS, surveys on air-cushion, navigation (line-guidance vs free-roaming) and localization systems.

- **Publications from IST team:**