

The Plasma-Facing Components Transporter (PFCT) : a Prototype System for PFC Replacement on the new ITER 2001 Cassette Mock-up (P2-G-500)

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The remote maintainability of the early ITER divertor cassette (based on the ITER 1998 design) was successfully proved during test campaigns carried out in the Divertor Refurbishment Platform (DRP) at the ENEA research centre at Brasimone over the period 1999-2003.

Due to subsequent major modifications in the ITER divertor cassette design, the main focus over the past few years has been on the design and manufacture of the various components, devices and tools needed for refurbishment of the new ITER 2001 Divertor Cassette.

The design of this new cassette differs substantially from the earlier version: in particular the shape, weight and attachment system of the Plasma Facing Components (PFC's) has been completely revised, and this also entailed a review of the procedures adopted for its refurbishment.

One of the major requirements of the cassette refurbishment process is removal and replacement of the three PFC's. In the old cassette concept, target replacement was performed by means of a purpose-built "C" frame slung from a standard bridge crane. The 2001 cassette design precludes such handling methods for a number of reasons, notably because of the extremely tight inter-PFC clearances, and the need for controlled inclination of the target in addition to normal translational movements, both impossible with a simple Cartesian crane.

To demonstrate the refurbishment feasibility operations for the new ITER Divertor 2001 cassettes, an experimental machine known as the Plasma-Facing Component Transporter (PFCT) has been designed, fabricated and commissioned in the years 2004-5. This full six degree-of-freedom system has been designed to handle payloads of up to 5 tonnes with good positional accuracy, and axes capable of very low joint velocities, including inclination of the PFC's over the range of $\pm 10^\circ$ in both horizontal axes, and controlled rotation about the vertical axis. Preliminary trials carried out during the commissioning phase have proved its suitability for the remote handling maintainability of the cassette, and further full remote trials are planned in the near future.

Details of the activities carried out and the results obtained will be illustrated and discussed in the paper.