



Ignitor Remote Handling System

L. GALBIATI, A. CUCCHIARO, A. PIZZUTO, *Associazione Euratom-ENEA sulla Fusione, Frascati, Italy*
A. BIANCHI, B. PARODI, *ANSALDO, Italy*
B. COPPI, *Massachusetts Institute of Technology, USA*



Abstract

The detailed design of the in-vessel Remote Handling System, based on the "two port concept" with two operating booms, has been completed. A 3D mock-up of the plasma chamber (PC) has made it possible to simulate the boom. This validates the ability of the boom, equipped with the attached end-effectors, to reach any in-vessel zone by 180° on each side without interferences. Thus, the operating

procedures applicable to several interventions have been established. Furthermore, a failure analysis of the boom components has been carried out in order to identify a recovery procedure. The design of the ex-vessel cabin with the function of holding the boom apparatus and managing the removal and installation of in-vessel components has been completed. The material removed from the PC is treated as radioactive waste material. The boom is made up by a sliding straight arm and articulated links. A structural analysis of both components under a maximum payload of 25 kg has evaluated an acceptable deflection of about 7 mm.

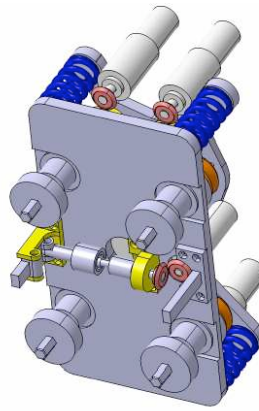


Figure 3. - Detail of coupling for the tile carrier End effector

The design of the in vessel RHS, based on two port concept, with the boom and its enclosure has been finalized.

The tile carrier end-effectors have been designed to optimize the installation and removal of the tile carriers (Fig. 2, Fig. 3).

The design is referred to a 3D Mock-up simulation inside the plasma chamber with the entire boom (Fig. 4). This allows to analyze the boom kinematics to cover all position with the various end-effectors and to start the study of the Remote Handling task operation (Figs 5a, b). Further, a failure analysis of the boom components to define a recovery procedure has been developed.

Remote Handling System

The in-vessel RHS is based on two Transporters made up of an articulated boom with end-effectors (Fig. 1), a support structure and a transport system. The transporters are supported by a movable support structure, which can be lifted and set in position adjacent to the working horizontal ports. The structure is set level and rigidly docked to the machine structure. Two opposite ports will be made available for RH interventions.

The support structure has two different platforms; one is used to receive the sealed and shielded casks of the components removed from the vessel and the other for trays carrying the new item to be introduced. The casks are enclosed in a container in order to allow, if necessary, uncontaminated transport inside the hot cell when first wall maintenance is needed.

The transporter is provided with two TV cameras plus one optical fibre in order to inspect the wall details. Lightening will be provided through the vertical ports.

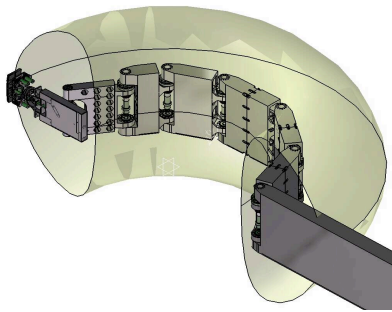
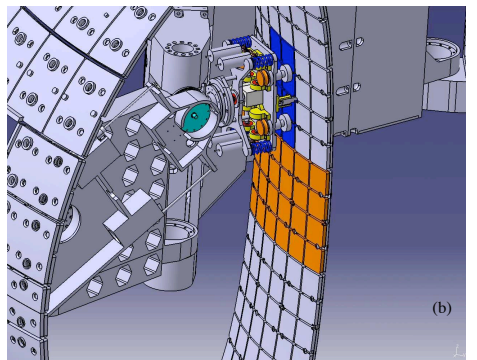
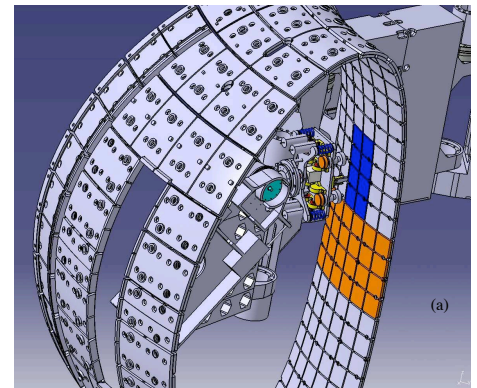


Figure 1. - Fully extended boom inside the PC.



Figures 5. - The approach to the first wall (a) and positioning of the tile carrier (b).

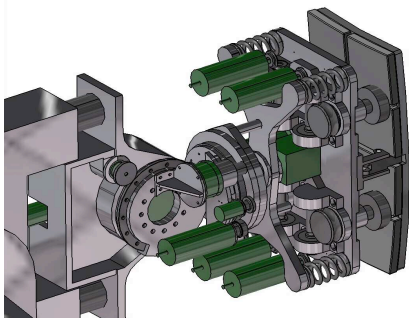


Figure 2. - End effector for tile carrier.

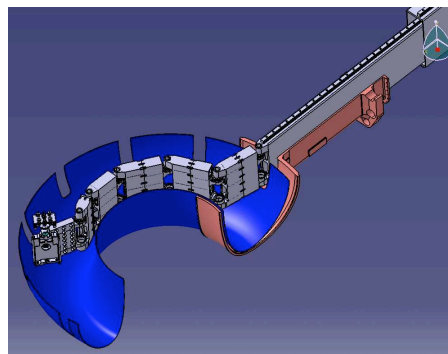


Figure 4. - The fully extended boom in operation inside the PC.