

ITER PPE TRAINEE PROGRAM: DESIGN OF AN ATTACHMENT SYSTEM FOR INTEGRATION OF PLASMA-FACING TEST COMPONENTS

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In the frame of the EFDA GOTP (goal oriented training program) on Port Plug Engineering (PPE) six work packages have been established as a collaboration between EFDA and several European Research Associations. In the Karlsruhe Institute of Technology (KIT), Institute for Neutron Physics und Reactor Technology (INR), the WP 4: “Design, manufacturing and integration of ITER relevant structural components” is hosted. In the frame of this work structural components for the integration of test and diagnostic devices into the equatorial port plug dedicated to the EU-HCPB-TBM are developed.

The structural connection of helium cooled plasma facing components in ITER to the water cooled structural port plug shield requires an attachment system, which is able to cope with two main contradicting requirements: The attachment system has to be solid in order to withstand mechanical loads due to deadweight as well as static and transient electro-magnetic loads (Maxwell forces during operation and different plasma disruption scenarios). On the other hand, the attachment system has to be flexible in order to compensate the different thermal strains in between the plasma facing test devices (300-550°C) and the port plug structure (~120°C), see Figure 1. Additionally, the design has to be adapted to the limited available space (electrical grounding, supply pipes and diagnostic lines).

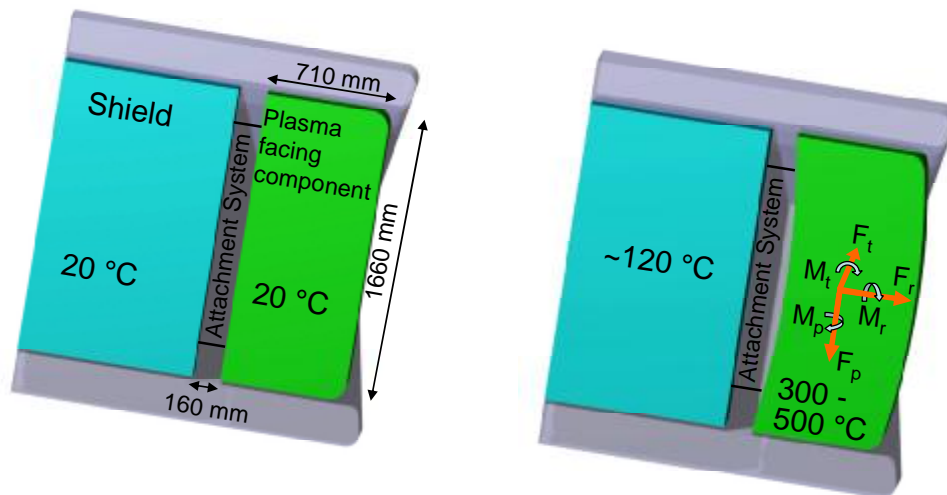


Figure 1: Attachment system at room temperature (left) and operating state (right)

Several design concepts have been studied at INR in the past years where a design based on flexible attachment blocks with lamellas turned out to be the most promising. This design currently is optimised in order to reduce the mechanical stresses to an acceptable level. In addition, further measurements, e.g. pre-heating before assembly, are proposed to reduce the stresses in operation. This paper presents the latest developments in the activity for design and analysis of an attachment system for connecting plasma facing test devices to an equatorial level port plug structure.