# THE TARGET FOR THE NEW PLASMA/WALL EXPERIMENT MAGNUM-PSI

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The construction of Magnum-PSI, a 3T superconducting linear device, is in its final stage at the FOM Institute for Plasma Physics Rijnhuizen. The aim of Magnum-PSI is to provide a controlled, highly accessible linear plasma device to perform the basic plasma-surface interaction research needed for the design of the plasma facing components of future fusion devices. The plasma conditions in Magnum-PSI reproduces the conditions expected in divertor region of ITER with particle fluxes in the range of $10^{24}$ $m^{-2}s^{-1}$ and peak heat flux densities of 5 to 10 $MW/m^2$, with a relatively low electron temperature of 1-10 eV. This contribution will focus on the thermal challenges imposed by those extreme conditions in the design of the target holder.

The target holder is designed to allow the exposure of large size targets (up to 60x12 cm, up to 100 kg) with variable inclination angles with respect to the magnetic field. The target can be rotated around the magnetic field axis to ensure a maximum diagnostic coverage. After plasma exposure, the target can be transferred in vacuum to the Target Exchange and Analysis Chamber (TEAC) in about 30 s. Different types of targets have been designed allowing a wide range of experiments. During the commissioning period, the target will be made of a molybdenum alloy (TZM) and will be installed on a copper heat sink. In order to mimic the conditions expected in ITER castellated targets (tungsten and carbon) with active and passive cooling have been designed. In addition, a modular target holder for sequential exposure of smaller size targets has been designed.

The target holder must be able to exhaust a steady state power of 100 kW, and a peak heat load higher than 10 $MW/m^2$. Finite element modelling using the ANSYS code was used to optimize the cooling geometry and to predict the temperature profiles due to the heat load of the plasma. Temperatures up to 2000 degree Celsius for full power and large targets and 3600 degree Celsius for narrow plasma beam experiments and limited power are foreseen. In addition, experiments were done using the Pilot-PSI linear device to check the thermal calculations. Calorimetry and infrared thermography were used to experimentally measure the temperature profile on the target and heat deposition from a given plasma. A test set up was made to test different interlayers (grafoil, soft metal sheets), to improve the thermal contact between the target and the heat sink.

In this contribution, the detailed design of the Magnum-PSI target holder will be presented together with results from the thermal calculations.