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Solid Tungsten Divertor-III for ASDEX Upgrade and Contributions to ITER

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AUG became a full tungsten experiment in 2007. At this time all plasma facing components have been coated with tungsten. To overcome the disadvantages of the coating - i.e. delamination of thick coatings, fast erosion of thin coatings in particular in the high heat load regime –we started to prepare a new outer divertor with solid tungsten at the outer strike line in 2010. The Div-III design was verified by extensive FEM calculations and high heat load testing of the target and its clamping structure in the test facility GLADIS. The Div-III concept was approved early in 2012 and the new divertor Div-III was installed in 2013.
The redesign of the outer divertor geometry was a chance to increase the pumping efficiency in the lower divertor by increasing the gap between divertor and vessel. This increases the conductance between roof baffle and cryo-pump that is located behind the outer divertor. We expect that this results in a lower collisionality in the outer scrape-off layer and consequently in a better overlap between AUG, JET and ITER SOL parameters. To keep the option for operation with high SOL densities, a by-pass valve was placed into the cryo-pump allowing to operate AUG with full or 1/3 of the pumping speed.
Safe divertor operation and heat removal becomes more and more significant for future fusion devices. This requires to develop 'tools'for divertor heat load control and to optimize divertor technology and geometry. Whereas the heat load receiving capability of target concepts can be tested in high heat load test facilities such as GLADIS in Garching, the target behaviour under plasma conditions has to be investigated in a fusion experiment. Here, the new divertor manipulator, DIM-II, offers a bunch of possibilities. DIM-II allows to retract a two target wide part of the divertor into a target exchange box without venting AUG. Different 'front ends'can be installed and exposed to the plasma. At present, front ends for probe exposition, gas puffing, electrical probes and actively cooled prototype targets are under construction.
The installation of solid tungsten, the control of the pumping speed and the flexibility for divertor modifications on a weekly base is a unique feature of AUG and offers together with the extended set of diagnostics the possibility to investigate dedicated questions for a future divertor design.

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