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# W7-X: Technology progress of the experimental campaign with divertor plasmas

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Wendelstein 7-X (W7-X), a fivefold symmetric stellarator located at the Max-Planck-Institute for Plasma Physics in Greifswald, Germany, was successfully taken in operation with short pulse limiter plasmas in 2015. Hereafter, ten symmetrically positioned un-cooled graphite divertors were installed, the plasma facing wall was refurbished with graphite tiles and various auxiliary systems and diagnostics were upgraded. The reinforcements allow for an increase of the energy input from 4 to 80 MJ.
The experimental campaign with island divertor plasmas was launched in August 2017. The main goal of this campaign is to demonstrate the capability of the un-cooled test divertor in high density and high power plasmas. In the island divertor concept, the divertor is positioned in front of the pumps (for the neutrals exhaust) and it only intersects the relatively cold resonant islands around the core plasma. In this way, convective heat loads are limited to 10 MW/m² and neutral pumping is effective, despite the fact that the divertor area represents only 10 % of the plasma facing surface.
Second goal of the experimental campaign is to prepare for the installation of the final water cooled divertor. The water cooled divertor is planned for 2020 and has to be installed with great care and high accuracy. It relies on the experience gained with the installation of the un-cooled divertor.
To improve the density in comparison to the first campaign with limiter plasmas, an injector of frozen hydrogen pellets was installed and a fast hydrogen gas inlet with piezo-valves mounted in cut-outs of the divertor were taken in operation. In addition, various diagnostics were added or enhanced before start of the divertor campaign.
The tests divertor campaign is split into two parts: During a short break a the middle of the experimental campaign, two so-called scraper elements are installed in front of their corresponding divertor to shield the sensitive edges of the divertor near the pumping gap. Aim of the scraper program is to compare the edge loads on the divertor with and without a scraper and to evaluate the impact of the scraper on the neutrals pumping efficiency. The scraper elements are monitored by additional diagnostics. The break was also used to take the first of two neutral beam injectors (NBI) into operation and to add or harden several diagnostics.

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