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Final Design and Fabrication of the TDU Scrapper for Wendelstein 7-X

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A divertor “scraper” has been designed to protect weakly-cooled regions of the Wendelstein 7 X (W7-X) divertor targets from overheating under certain steady-state conditions [1]. The scraper is a limiter-like component with a plasma-facing profile geometry that was numerically designed to shadow those vulnerable target regions under such conditions. The “TDU” scraper is an inertially cooled component designed to test the protective function of the scraper, and its impact on particle pumping, under pulsed operating conditions during the OP1.2 campaign in 2017-18. The TDU scraper design matches the steady-state profile geometry within 0.20 mm, but was simplified to reduce cost while satisfying requirements for pulsed W7-X operation with 80 MJ total plasma energy input and pulse intervals up to 20 minutes, constrained by the very limited space available near the divertor. The scraper units are instrumented with in-situ Langmuir probes, thermocouples, and a pressure manometer to support the test program. These test divertor unit scraper elements “TDU-SE” components will be located in two of the ten half modules during W7-X OP1.2 operation. This paper describes the design considerations and fabrication of these scraper elements for Wendelstein 7-X.

Eligible for student paper award?

No

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