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Limiter observations during W7-X first plasmas

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During the first operational phase (OP1.1) of the new W7-X stellarator, five poloidal graphite limiters serve as the main boundary for the plasma. For one of the limiters (Module 3) we have a common sight line for high resolution fast visible and mid-band infrared cameras, as well as filtered photomultipliers. Another limiter (Module 5) is instrumented with tangential view visible and near and long wavelength IR cameras, along with Langmuir probes. We will report on results from the first 3 months of operation. Dual heat stripes are seen for the first time on the limiters, and are consistent with diffusive and EMC3-EIRENE modelling [1,2,3] of the expected heat and particle flux patterns in a helical 3D magnetic field.

[1] F. Effenberg et al., "Numerical investigation of edge transport and limiter heat loads in Wendelstein 7-X startup plasmas", APS DPP meeting, Savannah, GA, 2015 –submitted for publication in Nuclear Fusion 2016.

[2] S. A. Bozhenkov, F. Effenberg, et al., "Limiter for the early operation phase of W7-X", 41st EPS Conference on Plasma Physics, P1.080, Berlin, (2014) <http://ocs.ciemat.es/EPS2014PAP/pdf/P1.080.pdf>

[3] T. Sunn Pedersen et al., "Plans for the first plasma operation of Wendelstein 7-X", Nucl. Fusion, 55, 126001 (2015) <http://iopscience.iop.org/article/10.1088/0029-5515/55/12/126001?fromSearchPage=true>

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