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Characterization of error fields and their impacts on Wendelstein 7-X SAMUEL LAZERSON, Princeton Plasma Physics Laboratory, MATTHIAS OTTE, MARCIN JAKUBOWSKI, Max-Plank-Institut fr Plasmaphysik, GLEN WURDEN, Los Alamos National Laboratory, UWE WENZEL, TAMARA ANDREEVA, SERGEY BOZHENKOV, CHRISTOPH BIEDERMANN, Max-Plank-Institut fr Plasmaphysik, GABOR KOCSIS, TAMAS SZEPESI, Wigner Research Center for Physics, JOACHIM GEIGER, THOMAS SUNN PEDERSEN, Max-Plank-Institut fr Plasmaphysik, DAVID GATES, Princeton Plasma Physics Laboratory, W7-X TEAM — The measurement and correction of magnetic fields which destroy flux surfaces (error fields) is critical to long pulse high beta operation in Wendelstein 7-X (W7-X). Even small error fields are predicted to cause overloading of divertor plates, as well as the loss of confinement. In the early commissioning phase of the experiment, the trim coils were used to open an n/m=1/2 island chain in a specially designed magnetic configuration. The flux surfacing mapping diagnostic was then able to directly image the magnetic topology of the experiment, allowing the inference of a small 4 cm intrinsic island chain. Scaled to the planned operating field (2.5 T), such error fields would be correctable using less than 10% the rated trim coil capacity. Numerical modeling confirms that a slight misalignment of the superconducting stellarator coil set is the source of this error field. Observations of the limiters temperatures in module 5 show a clear dependence of the limiter heat flux pattern as the perturbing n=1 fields are rotated. Thus the sources of error fields in W7-X are quantified and demonstrated to be correctable by the trim coil system.

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