

Even though this work concerns research at the W7-X stellarator facility, we would like to be placed in the international collaborations section. If you believe this to be the wrong section for our work, please place us in an appropriate stellarator session such as the "general stellarator configuration" session.

Abstract Submitted
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First results from the Wendelstein 7-X Phase Contrast Imaging Diagnostic¹ ERIC EDLUND, MIKLOS PORKOLAB, MIT Plasma Science and Fusion Center, OLAF GRULKE, ADRIAN VON STECHOW, LUKAS-GEORG BÖTTGER, Max Planck Institut für Plasmaphysik — Experiments in the first W7-X campaign achieved conditions of $T_e > 8$ keV, $T_i > 2$ keV and line-integrated densities of $\approx 3 \times 10^{19} \text{ m}^{-2}$, with energy confinement times close to the ISS₀₄ scaling at about 100 ms [1]. The addition of an island divertor for the OP1.2 campaign is expected to lead to improved plasma performance. Experiments from this campaign will investigate the relative balance of neoclassical and turbulent transport of energy and particles and further test the ISS₀₄ scaling. Gyrokinetic modeling indicates that there may be measurable differences in turbulence amplitude and quality as the mirror ratio and rotational transform of the magnetic geometry are changed. Among the new W7-X diagnostics is a Phase Contrast Imaging (PCI) system, a joint effort between MIT and IPP. The PCI diagnostic measures electron density fluctuations that may arise from turbulence or coherent modes. The system is capable of detecting fluctuations spanning a frequency range of about 1 kHz to 2 MHz, and wavenumbers of about 0.5 cm^{-1} to 30 cm^{-1} , depending on the optical configuration. We present initial PCI measurements of turbulent fluctuations in relation to global system parameters.

[1] Wolf et al., 2017, Nucl. Fusion, at press.

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