Abstract Submitted
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Investigation of Turbulence and Transport by Phase Contrast Imaging on the Wendelstein 7-X stellarator[1] ZHOUJI HUANG, MIKLOS PORKOLAB, MIT Plasma Science and Fusion Center, ADRIAN VON STECHOW, LUKAS-GEORG BOETTGER, OLAF GRULKE, JORGE ALCUSON, PAVLOS XANTHOPOULOS, JOSEPHINA PROLL, Max Planck Institute for Plasma Physics, ERIC EDLUND, SUNY Cortland, THE W7-X TEAM — While the Wendelstein 7-X stellarator is optimized to minimize the neoclassical transport, and the role of anomalous transport driven by turbulence remains largely unknown. A phase contrast imaging diagnostic (PCI) has been implemented on W7-X for turbulence measurement in the form of density fluctuations. Ion-scale turbulence is generally observed in W7-X and predicted to be driven unstable either by the ion temperature gradient (ITG modes) or by trapped electrons (TEM modes). Reduced anomalous impurity diffusion, and therefore longer impurity confinement times, were observed accompanied with reduced turbulence. Clear correlation between turbulence reduction and increase in the diamagnetic energy was observed in several scenarios where the density and ion temperature gradients were modified by external perturbations so that the gradient ratio η_{i} is about 1, where gyrokinetic simulations by GENE predicted reduced ITG and TEM activities. These observations suggest that turbulence plays an important role in the particle and energy transport in W7-X.

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