

Abstract Submitted
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Design and Initial Tests of a Gas-Puff Imaging Diagnostic for W7-X.¹ J.L. TERRY, S.G. BAEK, S.B. BALLINGER, W. MCCARTHY, MIT-PSFC, A. VON STECHOW, C. VON SEHREN, Max-Planck-Institut für Plasmaphysik, O. GRULKE, Max-Planck-Institut für Plasmaphysik and Technical University of Denmark, O. SCHMITZ, Univ. of Wisc. at Madison, W7-X TEAM — A Gas-Puff-Imaging (GPI) diagnostic is being designed for use on the W7-X stellarator. It will allow for detailed study of boundary and scrape-off-layer physics during the long-pulse W7-X operation period OP2. The main components of the diagnostic are 1) a system for puffing controlled amounts of H₂ or He gas into the outboard edge of the W7-X plasma, and 2) a system that images, with high time-resolution ($\sim 1 \mu\text{s}$) and good 2d spatial resolution ($\sim 5 \text{ mm}$), the emission resulting from the interaction of the puff with the local edge plasma. The nozzles used for the gas puff are novel in that they are “converging-diverging” cones inducing supersonic flow at and beyond the nozzle “throat”, thereby providing a more collimated beam. Good collimation is critical because the nozzle is $\sim 120 \text{ mm}$ outside the LCFS. Gas flow rates and expansion angles for the puffed beam are measured and will be presented. The design of the imaging system includes a water-cooled re-entrant tube with a metal turning-mirror that is deployed as part of the tube shutter. The turning-mirror allows observation of the emission along sightlines that are within 15° of the field-lines local to the emission region. The collected light is relayed up the tube and imaged directly onto an 8x16 array of APD detectors.

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