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Plasmas Near the Tokamak Divertor X–Point[1] M.J. SCHAFFER, General Atomics, J.A. BOEDO, R.A. MOYER, University of California, San Diego, T.D. ROGNLIEN, Lawrence Livermore National Laboratory, J.G. WATKINS, Sandia National Laboratories — The divertor X–point region, where four distinct plasma regions or quadrants meet, each with different temperature T, particle density n, pressure $p = nkT$, electric potential Φ, and velocity $\mathbf{v}$, is little studied. We measured the electron temperature and density, plus Φ and $\mathbf{v}_{\|}$ in all four quadrants of diverted plasmas in the DIII–D tokamak for both standard and reversed toroidal magnetic field B_{T} directions. The data yield the first observations of a strong $\mathbf{v}_{\mathrm{E}} = \mathbf{E} \times \mathbf{B}/B^2$ plasma flow in the divertor "private" quadrant and abnormally high potential and electron pressure, density, and temperature near the X–point. We compare the observations to 2-D transport modeling by the UEDGE code, recently improved to run with all the classical transport drifts, which also shows strong $\mathbf{v}_{\mathrm{E}}$ flow in the private quadrant. The $\mathbf{v}_{\mathrm{E}}$ flow is found to be a major contributor to the observed B_{T} direction dependence of divertor properties, while the electron overpressures are produced by high ion temperatures upstream of the divertor.

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