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**Feasibility of a Heavy Ion Beam Probe for W7-X** T.P. CROWLEY, D.R. DEMERS, P.J. FIMOGNARI, Xantho Technologies, LLC, Madison, WI, O. GRULKE, R. LAUBE, Max-Planck-Institute for Plasma Physics, Greifswald, Germany — A feasibility study of a Heavy Ion Beam Probe (HIBP) diagnostic for the Wendelstein 7-X (W7-X) superconducting stellarator, incorporating the accelerator and energy analyzer (currently in Greifswald) from the 2 MeV TEXT-U HIBP, is being carried out. The study's results are positive: beam trajectory simulations in the W7-X standard magnetic configuration, with central densities up to  $10^{20} \text{ m}^{-3}$ , predict that it will be possible to measure the equilibrium plasma potential and  $E_r$  at all radii, and simultaneously measure temporally and spatially resolved fluctuations of  $n_e$  and potential for  $r/a > 0.5$ . This will provide a unique capability to advance understanding of neoclassical and turbulent particle and energy transport in W7-X. Within this feasibility study, the beam is injected and detected through the K11 and N11 ports respectively, and the toroidal magnetic field is in the '+ $\varphi$ ' direction. Additional beam simulations reveal that most radii can be accessed in 7 other paradigm magnetic configurations. It's anticipated that electrostatic beam steering suitable for studying all these configurations is plausible; it will have plate dimensions comparable to TEXT-U's with smaller electric fields and higher voltages. Initial estimates of anticipated heat load from the W7-X plasma on the steering systems indicate it will be significant, but tractable. Our conclusion from these studies is that an HIBP diagnostic for W7-X is feasible. This work is supported by US DoE Award DE-SC0013918.

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