Abstract Submitted for the DPP15 Meeting of The American Physical Society

Operation of the Proto-MPEX High Intensity Plasma Source¹ J.B.O. CAUGHMAN, R.H. GOULDING, T.M. BIEWER, T.S. BIGELOW, I.H. CAMPBELL, S.J. DIEM, E.H. MARTIN, P.V. PESAVENTO, J. RAPP, H.B. RAY, G.C. SHAW, M.A. SHOWERS, Oak Ridge National Laboratory, G.-N LUO, Institute of Plasma Physics, Chinese Academy of Sciences — The Prototype Materials Plasma Experiment (Proto-MPEX) is a linear high-intensity rf plasma source that combines a high-density helicon plasma generator with electron and ion heating sections. It is being used to study the physics of heating over-dense plasmas in a linear configuration. The helicon plasma is produced by coupling 13.56 MHz rf power at levels up to 100 kW. Microwaves at 28 GHz (~ 150 kW) are coupled to the electrons in the over-dense helicon plasma via Electron Bernstein Waves (EBW). Ion cyclotron heating ($\sim 30 \text{ kW}$) will be via a magnetic beach approach. Plasma diagnostics include Thomson Scattering and a retarding field energy analyzer near the target, while a microwave interferometer and double-Langmuir probes are used to determine plasma parameters elsewhere in the system. Filterscopes are being used to measure D-alpha emission and He line ratios at multiple locations, and IR cameras image the target plates to determine heat deposition. High plasma densities in the helicon region have been produced in He $(>3x10^{19}/m^3)$ and D $(>1.5x10^{19}/m^3)$, and operation with on-axis magnetic field strength >1 T has been demonstrated. Details of the experimental results and future plans for studying plasma surface/RF antenna interactions will be presented.

¹ORNL is managed by UT-Battelle, LLC, for the U.S. DOE under contract DE-AC-05-00OR22725.

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Date submitted: 24 Jul 2015 Electronic form version 1.4