

Abstract Submitted
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Initial Operation of the Proto-MPEX High Intensity Plasma Source¹ J.B.O. CAUGHMAN, R.H. GOULDING, T.M. BIEWER, T.S. BIGELOW, S.J. DIEM, P.V. PESAVENTO, J. RAPP, H.B. RAY, G.C. SHAW, Oak Ridge National Laboratory, G.-N. LUO, Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, China — 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. It is being used to study the physics of heating over-dense plasmas, as well as exploring source interactions with a downstream target. The helicon plasma is produced by coupling 13.56 MHz rf power at levels up to 100 kW. Microwaves at 28 GHz (up to ~ 200 kW) are coupled to the electrons in the over-dense helicon plasma via Electron Bernstein Waves (EBW). Ion cyclotron heating (~ 30 kW) is via a magnetic beach approach. Tungsten baffles are used to help control neutral pressure between the helicon source and a tungsten target. Plasma diagnostics include Thomson Scattering and a retarding field energy analyzer to determine plasma parameters near the target, while a microwave interferometer and Langmuir probes are used to determine plasma parameters near the source and elsewhere in the system. High plasma densities have been produced in He ($>3 \times 10^{19}/\text{m}^3$) and D ($>1.5 \times 10^{19}/\text{m}^3$), and operation in magnetic field strengths up to 1T has been demonstrated. Details of the experimental results will be presented, as well as future plans for studying plasma surface interactions and rf antenna plasma interactions.

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