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The PhIX High Intensity Plasma Source[1] R.H. GOULDING, J.B.O. CAUGHMAN, Y.-K.M. PENG, J. RAPP, D.A. RASMUSSEN, T.M. BIEWER, J.M. CANIK, G. CHEN, S.J. DIEM, S.J. MEITNER, L.W. OWEN, Oak Ridge National Laboratory — The Physics Integration eXperiment (PhIX) is a linear high-intensity rf plasma source presently being constructed at ORNL that combines a high density helicon plasma generator with an electron heating section. It will be used to explore the physics related to heating an overdense, streaming plasma in a linear geometry by whistler waves and Electron Bernstein Waves (EBW), including optimization of heating efficiency and maximization of particle flux. Interactions between the plasma production and heating regions, and the source and a downstream target, will also be investigated. Experiments using the device will provide data for the design of an rf powered high particle flux ($\sim 10^{24}/m^2 - s$), high heat flux($\sim 10MW/m^2$) steady-state linear plasma-materials test station (PMTS). In preparatory experiments, the helicon device has operated at power levels up to 90 kW, producing high plasma densities in He ($6 \times 10^{19} m^{-3}$) and D ($> 4 \times 10^{19} m^{-3}$), and has also operated at high magnetic field strength up to 0.5 T. Separate ECH experiments have demonstrated both whistler and EBW coupling at 6 GHz to an overdense plasma. A review of these experiments will be presented, as well as an overview of PhIX and its status.

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