Initial Operation of the PhIX High Intensity Plasma Source


— The Physics Integration eXperiment (PhIX) is a linear high-intensity rf plasma source that combines a high-density helicon plasma generator with an electron heating section. It is being used to study the physics of heating over-dense plasmas in a linear configuration, 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 18 GHz are coupled to the electrons in the over-dense helicon plasma via whistler waves and Electron Bernstein Waves (EBW). An energy analyzer embedded in the target substrate is being used to determine the ion energy and ion flux at the target, while a microwave interferometer and Langmuir probes are used to determine plasma parameters near the source and near the target. High plasma densities have been produced in He (> 5x10^{19}/m^3) and H (> 1.5x10^{19}/m^3), and operation in magnetic field strengths up to 0.5T 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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