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Optimization and Characterization of a Helicon Ion Source on an Inertial Electrostatic Confinement Device for Helium-3 Fusion GABRIEL BECERRA, GERALD KULCINSKI, JOHN SANTARIUS, University of Wisconsin-Madison — HELIOS is an inertial electrostatic confinement (IEC) fusion device designed for ^{3}He-^{3}He fusion studies as part of the advanced fuels program at the University of Wisconsin [1]. HELIOS uses a helicon plasma as a source of ions, which are subsequently accelerated radially to fusion energies by the electrostatic field between the spherical chamber wall and a concentric cathode grid. The experimental setup, in which ^{3}He-^{3}He fusion in an IEC system has previously been demonstrated, has since been upgraded to raise fusion rates to allow for diagnostic studies of IEC physics with helium-3 fuel, in order to benchmark the single-atomic-species formalism of a numerical code on spherically convergent ion flow [2]. The helicon ion source has been characterized through double probe measurements of plasma density and electron temperature for various rf antenna and magnetic field geometries and upgraded to deliver higher ion currents.

[1] G.R. Piefer et al., Fusion Sci. Technol. 47, 1255 (2005).
[2] G.A. Emmert and J.F. Santarius, Phys. Plasmas 17, 013502 (2010).

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