

Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Physical requirements and milestones for the HIT-PoP Experiment THOMAS JARBOE, University of Washington — Recent success with HIT-SI demonstrates the viability of steady inductive helicity injection (SIHI) as a spheromak formation and sustainment method. Results include the sustainment of toroidal current of over 50 kA, up to 40 kA of plasma current that is separate from the injectors, toroidal flux up to 6 times the peak injected flux, and $j/n > 10^{14}$ Am. All were achieved with 10MW or less applied power. This paper explores the requirements for a confinement test of the concept using a larger proof of principle experiment. The confinement experiment must not exceed the beta limit, the drift parameter limit, or the wall loading limit, where the drift parameter is (drift of electrons relative to ions to produce current)/(ion thermal speed). It must also exceed a minimum j/n , a minimum na , and a minimum electron temperature, where a is the minor radius. The drift parameter limit and beta limit appear to play defining roles in spheromak performance leading to a very favorable scaling of wall loading with size. The milestones sequence suggested is the following: 1. Startup at drift parameter and beta limit minimum density. 2. Raise current until j/n exceeds 10^{-14} Am. 3. Raise the current and temperature until $T \approx 50$ eV for good ionization. 4. Raise the current and density until $na > 2 \times 10^{19} \text{ m}^{-2}$ for neutral screening. 5. Raise current and temperature until $T > 200$ eV so magnetic confinement can be studied.

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Date submitted: 13 Jul 2011

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