

Abstract Submitted  
for the DPP06 Meeting of  
The American Physical Society

**Current multiplication and flux amplification in magnetic helicity injection**<sup>1</sup> XIANZHU TANG, Los Alamos National Laboratory, ALLEN BOOZER, Columbia University — The usefulness of magnetic helicity injection in toroidal concepts such as the spherical torus under co-axial helicity injection (ST-CHI), the spheromak, and the spherical torus with a plasma center column (ST-PCC), is measured by the concepts of current multiplication and flux amplification. The current multiplication factor is defined as the ratio of the toroidal plasma current inside the discharge chamber and the injector current that is collected on the electrodes. The flux amplification factor is defined as the ratio of the poloidal magnetic fluxes inside and outside the magnetic separatrix. One desires a high current multiplication factor because it implies a low engineering recirculating power requirement. The flux amplification factor gives a more direct measure of the effectiveness of the helicity injection scheme. High flux amplification implies that a higher strength plasma confining magnetic field is achieved for a given bias poloidal magnetic field. These two concepts are related, but significant difference exists for the case of ST-CHI, in contrast to the spheromak and ST-PCC cases. We will present the theory and calculation that clarify the subtle physics and its implications for the actual experiments.

<sup>1</sup>Work supported by DOE OFES

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Date submitted: 21 Jul 2006

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