Abstract Submitted for the 52nd Annual Meeting
Division of Plasma Physics
November 8–12, 2010, Chicago, Illinois

Category Number and Subject:

[ ] Theory [X] Experiment

Addressing the New Challenges of Burning Plasma Physics With Dominant Electron Heating on DIII-D, T.S. Taylor, R.J. Buttery, *General Atomics* – Future burning plasma devices will be heated predominantly through the electrons, with low torque injection, core fuelling and collisionality, while steady state operation will demand highly off-axis currents to ensure stability and good transport. In contrast, most present devices heat through the ions, with high torque, core fuelling, and relatively peaked current profiles. These differences have dramatic impacts on the performance, stability and transport in fusion plasmas. Thus an upgrade is proposed to DIII-D to provide dominant electron heating and steady state current profiles via an upgrade to 15 MW electron cyclotron heating (ECH), enabling access to burning plasma relevant parameters in regimes ranging from the ITER baseline to power plant-like $q_{min}>2$ steady state scenarios, with independent control of T_e/T_i, rotation, collisionality, current profile and β. This will provide vital and unique capability to resolve the physics of burning plasmas and device designs, as well as critical tests of fusion simulation in the new regimes for which they must be developed.

*Supported by the US Department of Energy under DE-FC02-04ER54698.