Demonstration of ITER Operational Scenarios on DIII-D **Ex-C**

E.J. Doyle

Physics Dept. and PSTI, University of California, Los Angeles, CA 90095, USA

The DIII-D program has recently initiated an effort to provide suitably scaled experimental evaluations of the primary ITER operational scenarios. New and unique features of this work are that the plasmas incorporate as constraints leading operational features of the ITER scenarios, such as the design values for the ITER plasma cross-section and aspect ratio, and that all four primary ITER scenarios have been evaluated on a single device, enabling direct cross-comparisons. Key aspects of the ITER baseline or reference scenario (Scenario 2), steady-state (Scenario 4), hybrid (Scenario 3), and ``advanced inductive" plasmas have been replicated successfully, providing an improved physics basis for transport and stability modeling and performance extrapolation to ITER. In all four scenarios performance equals or closely approaches that required to realize the physics and technology goals of ITER. Utilizing a version of the ITER plasma scaled by a factor of 3.7, and with aspect ratio of 3.1, conventional ELMy H-mode baseline scenario plasmas have been operated at the target I/aB value of 1.415, corresponding to $q_{95}\sim$3, with normalized beta of 1.8-2.0. Operation at the higher normalized beta level provides normalized fusion performance close to the level required for Q=10 operation on ITER. For the steady-state scenario, plasmas were run with the same ITER-like shape and aspect ratio, but with $q_{95}\sim$4.7, $q_{min}\sim$1.5 and normalized beta of 2.7-3.0. At the higher beta, normalized performance at the level required for Q=5 operation on ITER was obtained. Hybrid plasmas with $q_{95}\sim$4.1 and normalized beta $\sim$2.8 achieve normalized performance close to the level required for Q=10 operation on ITER. Finally, the advanced inductive scenario, which targets the ITER Q=30 physics goal, was operated with $q_{95}\sim$3.3 and normalized beta $\sim$2.8, resulting in performance well above the level required for Q=10 operation in ITER. A new and significant issue is the fact that the value of $l_i(3)$ in all scenarios is below 0.7, outside the present ITER plasma shape control system design range of 0.7-1.0. The demonstration discharges also provide more realistic experimental profiles to use in transport and stability modeling for ITER, which will be presented at the IAEA meeting. Work supported by the US Department of Energy under DE-FG02-01ER54615.