Abstract Submitted
for the DPP97 Meeting of
The American Physical Society

Sorting Category: 5.1.1.2 (theoretical)

Theoretical Considerations for Liquid Jet Injection into Tokamak Plasmas[1] P.B. PARKS, General Atomics, M.N. ROSENBLUTH, ITER San Diego Joint Work Site, W.D. SESSIONS, Tennessee Technological University, E. GESKIN, New Jersey Institute of Technology, S.C. JARDIN, Princeton Plasma Physics Laboratory —
The purpose of hydrogen, or helium, liquid jet injection for high-current ITER-like plasmas is to deliver a rapid and massive plasma density increase in order to prevent avalanche runaway electron formation during disruptions and preemptive plasma terminations. Multiple pellet injection may be too slow for this purpose, and killer impurity pellets can cause runaways and because of their limited penetration range, can generate steep pressure gradients, leading to a core energy quench. After complete jet burnthrough and isobaric cooling, a nearly flat temperature profile of a few hundred eV is established which can provide a pathway for deep penetration of a killer "stealth" pellet that takes out the thermal and magnetic energy by radiative dissipation. This disruption mitigation blueprint is being studied for ITER using a recently modified jet ablation theory coupled with the TSC plasma simulation code. Also discussed is a LHe or LCH_4 jet injection concept for future plasma quench and disruption mitigation experiments in DIII–D.

[1]Work supported by U.S. DOE Grant DE-FG03-95ER54309.

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Date submitted: July 7, 1997 Electronic form version 1.2