Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Optimizing Fueling Profiles in ITER and DIII-D by a Gyrotron-Powered Pellet Injector (GPPI)\(^1\) F.W. PERKINS, P.B. PARKS, General Atomics — The fueling system is an essential element in a tokamak reactor and control of its thermonuclear reactions. Pellets, accelerated by gyrotron-driven pellet injector [1], will provide sources of plasma density and energy. Subsequent evolution of density profiles depends strongly on toroidicity and position within a magnetic surface. We report the studies of ITER experiments for optimizing fueling profiles. With modest modifications, a scaled demonstration of GPPI is possible on DIII-D. For the ITER example, a GPPI has been designed to maximize four pellet properties: speed \((V > 3 \text{km/s})\), barrel bore \((d \leq 10.0 \text{mm})\), launch position (inside magnetic mid-plane), and launch trajectory (orthogonal to separatrix). The speed anticipated for the GPPI is more than a factor-of-10.0 above the limit of 300 m/s for a conventional guide-tube. The penetration of ablation ionization source increases a factor-of-6.0 with an order-of-magnitude increase in \(V\). Previous models with \(V^{1/3}\) scaling, predicted just a factor-of-2.2. Breakdown limitations will also be addressed.


\(^1\)Supported by the US DOE under DE-FG03-95ER54309.

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Date submitted: 21 Jul 2006

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