

Abstract Submitted
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A Gyrotron-Powered Pellet Accelerator for Tokamak Fueling¹

P.B. PARKS, F.W. PERKINS, General Atomics — A novel pellet acceleration concept [1] using microwave power from MW gyrotron sources has been developed that could pave the way for high-speed >3 km/s inner-wall pellet injection on ITER-class tokamaks. The concept is based on the principle of a gun, where a high-pressure propellant gas drives the projectile down the barrel. In the proposed concept, the high gas pressure is created by evaporative explosion of a composite “pusher” medium attached behind the DT fuel pellet. The pusher consists of micron-sized conducting particles, (Li, Be, C) embedded uniformly in a D₂ ice slug with $<5\%$ volume concentration, thus facilitating microwave energy absorption by dissipation of eddy currents flowing within the conducting particles only. Microwave power is delivered to the pusher along a waveguide, which also serves as the pellet launch tube. A scaling law predicts that a pellet of mass M accelerated over a distance L reaches a velocity $v \cong (PL/M)^{1/3}$, where P is the gyrotron power. [1] P. Parks & F. Perkins, US patent application “Microwave-Powered Pellet Accelerator,” No. 11/256/662, October 21, 2005.

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