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A Gyrotron-Powered Pellet Accelerator F.W. PERKINS, Princeton Plasma Physics Laboratory, P.B. PARKS, General Atomics — Plans for fuelling ITER call for accelerated pellets which propagate in guide-tubes. The tubes undergo 90 $^\circ$ bends so that the pellets can enter the plasma along the high field-side of the separatrix. Both theory and experiment find that for V$\geq$ 500m/s, centrifugal force in the bends will fracture the pellets and elongate the cloud of debris. This contribution outlines the design of a plasma accelerator sufficiently flexible so that 90 $^\circ$ bends can be avoided for the high-speed portions of the trajectory. The key element is to recognize that the guide tubes can also serve as a waveguide for millimeter waves. Operation proceeds as follows: A pellet is introduced into a guide tube of diameter 5mm at low velocity $\sim$10m/s and propagates until the remaining trajectory is straight and normal to separatrix. At this point, a 1 MW gyrotron is energized and power propagates until it encounters the pellet. The pellet has a 4-region structure and acts as a gun. The rear region (5mm) is diamond which passes the millimeter waves and provides inertia. Next is a 2mm region of frozen D doped with lithium which adsorbs the millimeter waves and vaporizes. The third region is a thin lithium layer which is several skin depths in extent and reflects millimeter waves. The 5 mm front region is a frozen DT bullet accelerated by the vaporized absorbing layer. The bullet now has a straight trajectory. 1D simulations of the gun will be presented.

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