

A COMPACT FLEXIBLE PELLET INJECTOR FOR THE TJ-II STELLARATOR

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A compact multi-barrel pellet injector system is being developed and built for the TJ-II stellarator device. Its design is based on that of the pellet injector currently installed at the MST facility (Univ. Wisconsin). It provides maximum flexibility at minimal cost, while also allowing for future upgrades. The TJ-II is a medium sized heliac device ($R = 1.5$ m, $\langle a \rangle = 0.22$ m, ~ 400 kW ECRH, ~ 2 MW NBI, $T_{\text{pulse}} < 250$ ms). It is intended to provide the TJ-II with a four-barrel (two initially) system for operation both as a plasma diagnostic and as a source for performing plasma-fuelling experiments. In order to attend both objectives a flexible system will be provided where frozen hydrogen pellets with diameters from 0.4 to 1 mm can be produced and accelerated to velocities between 150 and 1000 m s⁻¹. The smallest pellet sizes will make demands on current technology and know how, in particular the mechanical punch/propellant valve propulsion system, while modifications to the light-gate and microwave-cavity pellet diagnostics will be needed in order to cover the intended pellet size range. Next, because of space restrictions and nearest-neighbor consideration the pellet injector overall length has been shortened to <1.7 m (mechanical punch end to final guide tube interfaces) by a redesign of the gun barrel, vacuum coupling and gas dump sectors. Attached to the interfaces, short guide tubes direct the pellet to the plasma center. Finally, the system is completed by stand-alone instrumentation and controls, as well as LabView controlled gas manifolds.