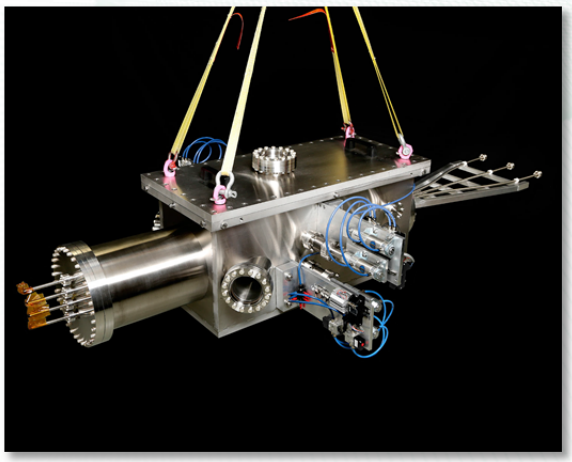
Fusion Pellet Fueling Laboratory

Description

The Fusion Pellet Fueling Laboratory provides test equipment and related diagnostics for carrying out experiments directed at development of pellet injectors for plasma fueling applications, with recent emphasis on systems for DIII-D and ITER. Several experiments are set up in the lab at any given time. In general, various sized pellets composed of frozen hydrogen isotopes (protium and deuterium) are produced and accelerated with light gases (hydrogen and helium) to speeds of 100 to 3000 m/s. Cryo-coolers and liquid helium dewars are used routinely to provide the low temperatures (<20 K) required to freeze solid hydrogen or deuterium from the gas feeds, including continuous extrusions of hydrogen "ice." Most systems also operate under vacuum conditions. Experiments are also conducted with other frozen gases (e.g., neon or argon) to study the freezing and acceleration processes. In addition to pellet fueling R&D, experiments are carried out to support other related fusion technologies, including systems for gas fueling, plasma disruption mitigation, recycling of pellet and propellant gas streams, specialized vacuum pumping applications (e. g., cryo-pumps and other roughing pumps for ITER). A few key systems for ITER are being developed in the lab, with the final systems scheduled to be ready for delivery and installation before the first ITER plasmas.

Twin-screw extruder that is being developed for ITER pellet injectors; it will provide a continuous stream of solid hydrogen to mechanisms that will cut/chamber and then accelerate pellets (10 to 20 per second at speeds of ~300 m/s)



A pellet selector for the ITER pellet injection system. It will direct 5 mm fueling or 3 mm ELM pacing pellets travelling at ~300 m/s from four injector locations to any three plasma injection locations.

A three – barrel shattered pellet injector for the ITER disruption mitigation system. It will provide pellets with a neon core and a deuterium shell that are shattered into small particles (< 5 mm) before entering the plasma.

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