

Disruption mitigation for ITER

Disruptions are sudden unplanned terminations of the plasma that can damage the plasma chamber from thermal loads, high magnetic forces, and runaway electrons. A reliable fast acting tool to mitigate these effects in ITER burning plasmas by the injection of large quantities of mass into the plasma is needed. The new shattered pellet technique, which was developed at ORNL as part of the VLT fueling program, has been updated with a new shattering technique for the large cryogenic pellets. The new shattering technique consists of accelerating the pellet into a conical funnel to collimate the resulting spray of deuterium or neon for maximum penetration. A conceptual design of a multi-barrel injector using this technique has been developed for ITER. The injector contains six to eight barrels and can be located inside a port plug for close proximity to the plasma and fast injection. Multiple injectors can be located around the machine to keep the resulting dissipative heat flux below destructive levels. Plans are being developed to test shattered pellet injection from multiple locations and its effectiveness at thermal load and runaway electron mitigation on existing machines.