

## Recent Progress on IGNITOR High-Speed Pellet Injector

For several years, researchers from ORNL and ENEA-Frascati in Italy have been working together on development of a new four-barrel high-speed pellet injection system in support of Italy's proposed IGNITOR fusion experiment. ORNL provides the cryogenic system for freezing the pellets from deuterium gas at temperatures of  $\sim 10$  K and the diagnostics for evaluating pellet quality, size, and speed. ENEA-Frascati provides the two-stage light gas gun systems used to accelerate the pellets to high speeds, with  $\sim 2000$  m/s recorded to date. In addition, the system is equipped with ORNL propellant valves for simple gas acceleration, with speeds limited to  $\sim 1000$  m/s. Several experimental campaigns of the integrated systems have been carried out at ORNL with the reliability and performance parameters improving on each campaign. Two ENEA-Frascati researchers recently visited ORNL (May 2011) and helped in the installation and testing of four new ENEA target systems that will be used in the next experimental campaign to accurately measure pellet dispersion from each gun barrel. Before the visit, ORNL researchers had made some major modifications to the injection line to ensure free flight of the pellets from the gun muzzles to the new targets ( $\sim 1$  meter distance). At the higher pellet speeds, collisions with any surface will typically result in fracturing of the pellets. At this time, the pellet formation process and acceleration with propellant valves have been optimized, including the highest levels of reliability and repeatability. The next experimental campaign is tentatively scheduled for later this year and will concentrate on optimizing the operating parameters and performance of the two-stage light gas gun systems. The system could be made available for a fusion experiment in the near future.