A FREE-JET MERCURY SYSTEM FOR USE IN A HIGH-POWER TARGET EXPERIMENT

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SCHEDULE
· Target Flow Testing at ORNL – April 2006
· Integrated System Test with Solenoid at MIT – August 2006
· System Test with Proton Beam at CERN – March 2007

PRIOR WORK
E951 Tests (H.Kirk, BNL)
· 1cm dia Hg jet
· 24 GeV 4TP beam
· No magnetic field
· Jet dispersed by beam

CERN/Grenoble Tests (A. Fabich, J. Lettry - NuFact’02)
· 4cm dia, 12m/s Hg jet
· 0.1,0.2T magnetic field
· No proton beam
· Tests at 20T demonstrated MHD stability

Hg FREE-JET TARGET DESCRIPTION
The target concept is similar to a high-power production target needed for a neutrino factory or muon collider
The Hg target is part of a proof-of-principle experiment to investigate the interaction of a proton beam, high magnetic field, and high-Z target

Target System Schematic Layout

TARGET DESIGN
The Hg Target System consists of
- Syringe Pump - 800 psi, hydraulically-actuated piston with inventory for 12-sec jet duration (18 liters)
- Primary Containment - all Hg-wetted surfaces including piping, nozzle, sump tank, & pump
- Secondary Containment - predominiately sheet metal boundary to contain Hg vapors and and potential leaks
- Beam Windows - Titanium alloy ports installed in primary/secondary containments designed to withstand beam energy
- Laser Optic Diagnostics - fiber optic bundles/lenses integrated with high-speed cameras to observe jet/beam interaction at multiple locations along jet path
- Design meets safety requirements for handling, storage, and transportation of Hg
- System currently in final design phase

EXPERIMENTAL FACILITY

EXPECTED RADIATION LEVELS
Estimated contact dose rates on solenoid at Z=0
(200 pulses, 16x10^{12} pps)
- 40 mrad/hr after 1 hr
- 13 mrad/hr after 1 week
- 1 mrad/hr after 1 year

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