

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

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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*

Operating Characteristics

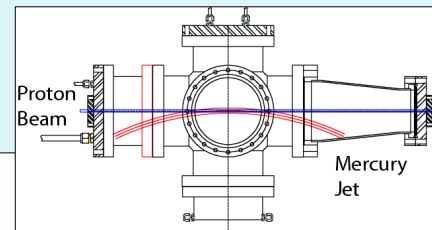
- 20-m/s, 1-cm dia jet,
- 15 Tesla magnetic field
- 24-GeV, 1MW proton beam
- Up to 200 beam shots on target at 30-minute intervals

Test is designated by CERN as nTOF11. Scheduled for Spring 2007.

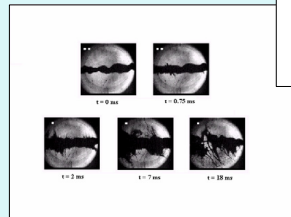
PRIOR WORK

E951 Tests (H.Kirk, BNL)

- 1cm dia Hg jet
- 24 GeV 4TP beam
- No magnetic field
- Jet dispersed by beam



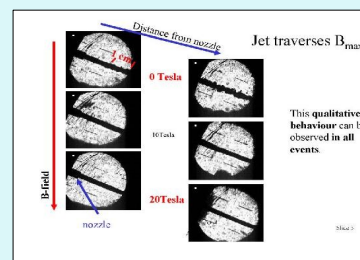
E951 Test Setup



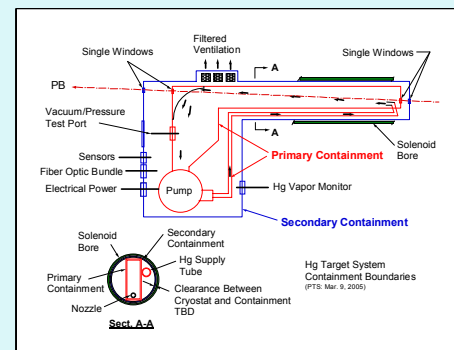
E951 Results

CERN/Grenoble Tests (A. Fabich, J. Lettry - NuFact'02)

- 4cm dia, 12m/s Hg jet
- 0,10,20T magnetic field
- No proton beam
- Tests at 20T demonstrated MHD stability



CERN/Grenoble Test Results

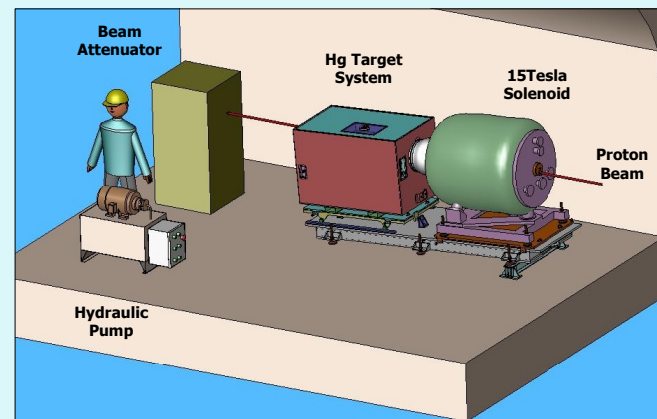


Target System Schematic Layout

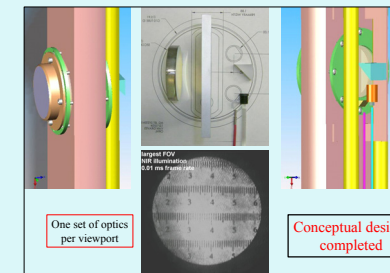
TARGET DESIGN

The Hg Target System consists of

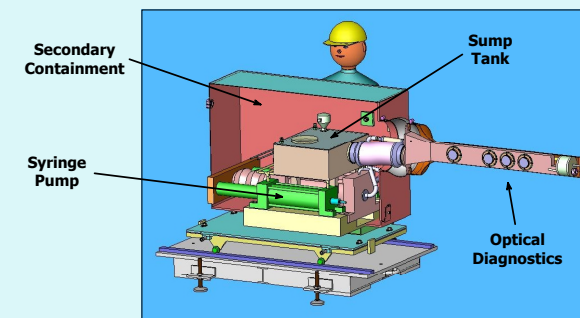
- **Syringe Pump** - 800 psi, hydraulically-actuated piston with inventory for 12-sec jet duration (18 liters)
- **Primary Containment** - all Hg-wetted surfaces including piping, nozzle, sump tank, & pump
- **Secondary Containment** - predominately sheet metal boundary to contain Hg vapors and potential 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



Experiment Layout



Optical Diagnostics Configuration



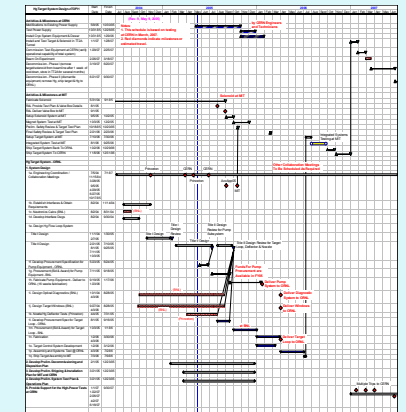
Target System Internals

Expected Radiation Levels

- Estimated contact dose rates on solenoid at Z=0 (200 pulses, 16×10^{12} ppp)
- 40 mrad/hr after 1 hr
 - 13 mrad/hr after 1 week
 - 1 mrad/hr after 1 year

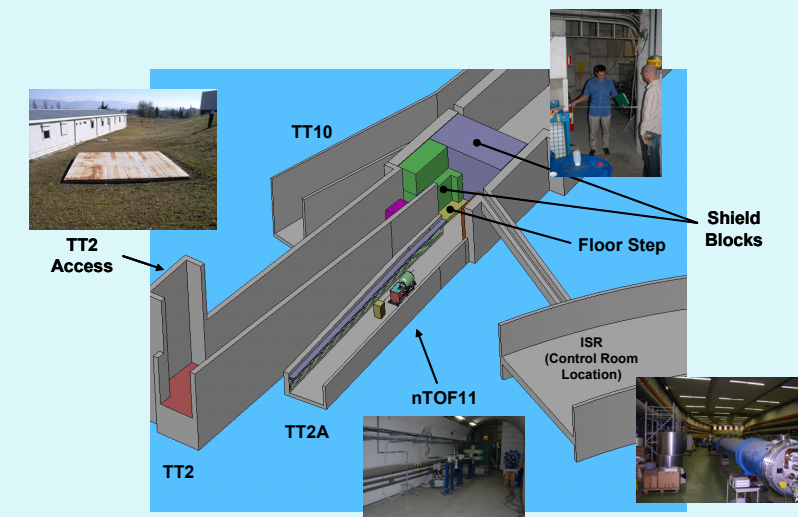
SCHEDULE

- 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



Project Schedule

EXPERIMENTAL FACILITY



Experiment Location in CERN TT2A Tunnel

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