The MERIT Experiment

NFMCC
Collaboration Meeting

UCLA

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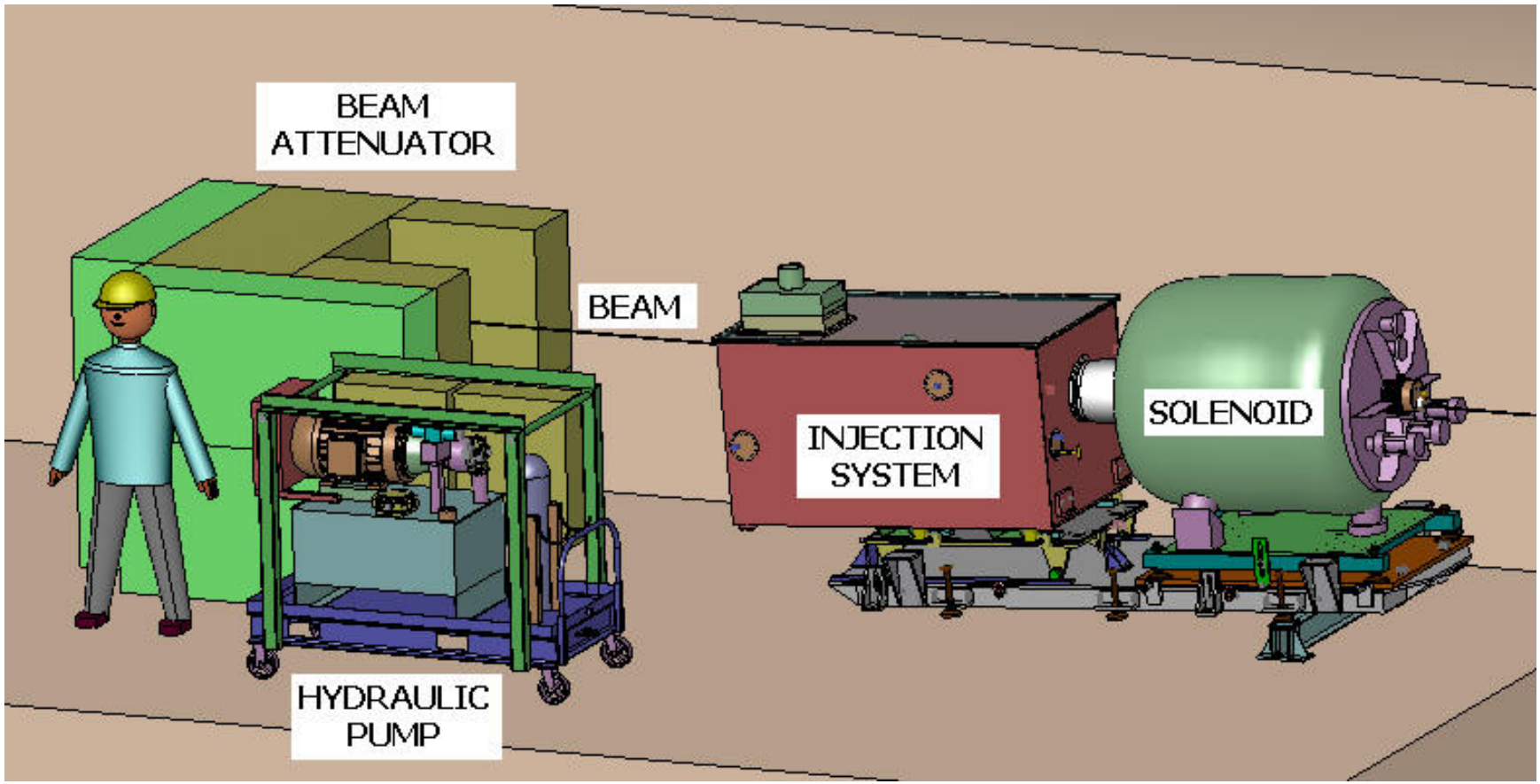
Experimental Goals

The MERIT (nTOF11) Experiment

- Study single beam pulses with intensities up to 30TP
- Study influence of solenoid field strength on Hg jet dispersal (B_o from 0 to 15T)
- Study 50 Hz operations scenario
- Study cavitation effects in the Hg jet by varying PS spill structure—Pump/Probe
- Beam on target July 2007
- **Confirm Neutrino Factory targetry concept**

The MERIT (nTOF11) Experiment



MERcury Intense Target

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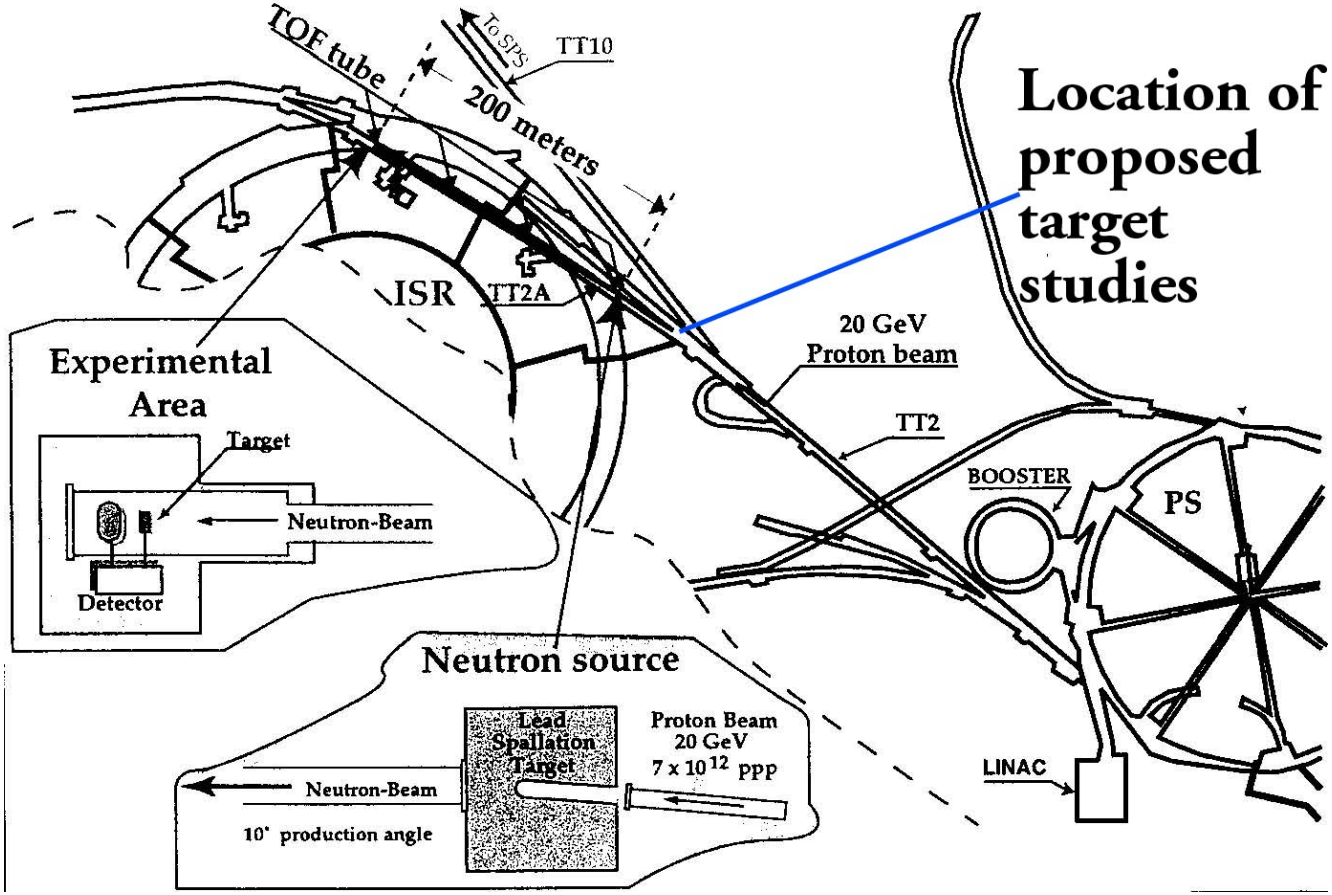
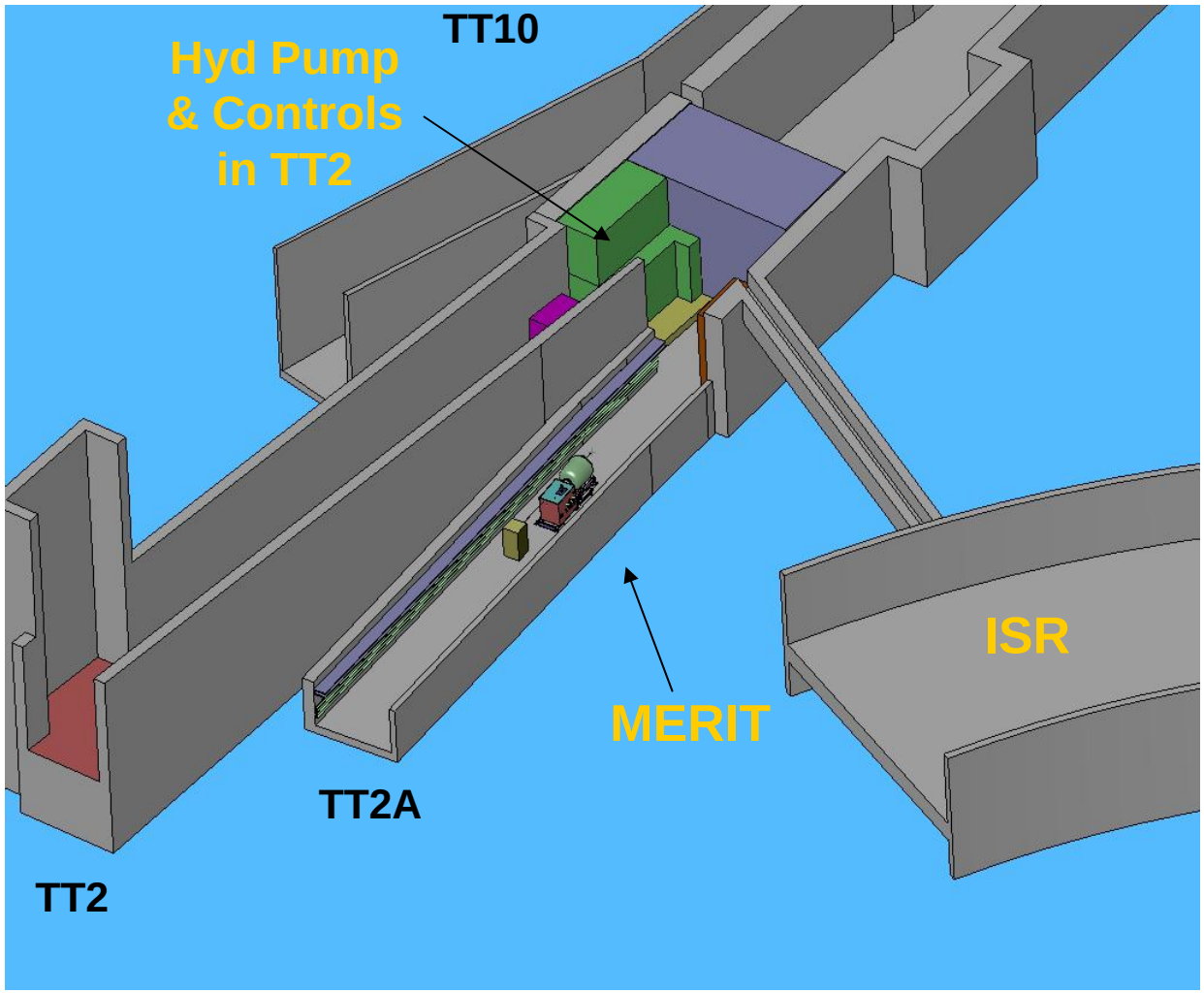
Target Test Site at CERN



The Tunnel Complex



Profile of the Experiment

- 14 and 24 GeV Proton beam
- Up to 30 x 10^{12} Protons (TP) per 2μs spill
- Proton beam spot with r ≤ 1.5 mm rms
- 1cm diameter Hg Jet
- Hg Jet/Proton beam off solenoid axis
  - Hg Jet 33 mrad
  - Proton beam 67 mrad
- Test 50 Hz operations
  - 20 m/s Hg Jet
  - 2 spills separated by 20 ms

PS Beam Characteristics

- PS will run in a harmonic 16 mode
- We can fill any of the 16 rf buckets with sub-bunches at our discretion.
- Each microbunch can contain up to 2.5 TP.
- Fast extraction can accommodate entire 2μs PS fill.
- Extraction at 24 GeV
- Partial/multiple extraction possible at 14 GeV
- Beam on target July 2007

Run plan for PS beam spills

The PS Beam Profile allows for:

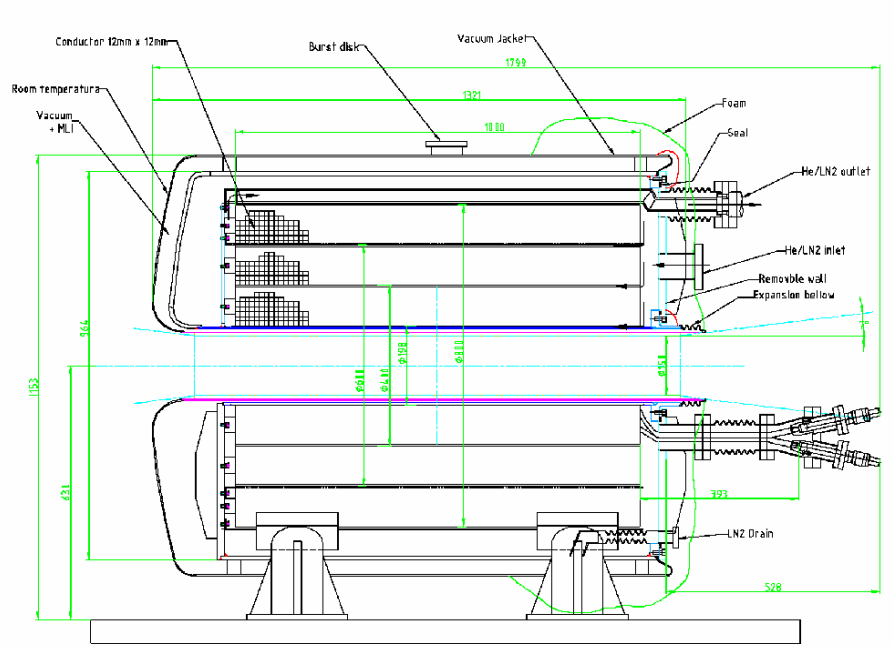
- Varying beam charge intensity from 4 TP to 30 TP.
- Studying influence of solenoid field strength on beam dispersal

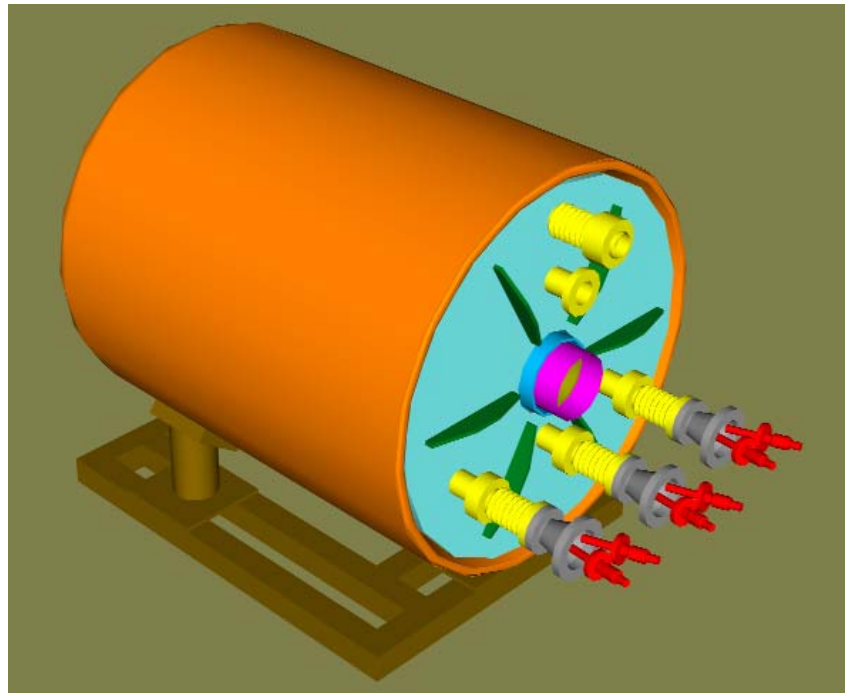
  (vary B_o from 0 to 15T).
- Study possible cavitation effects by varying PS spill structure (Pump/Probe)
- Study 50 Hz operation.

Key Experimental Sub-systems

- 15T Pulsed Solenoid
  - 5.5 MVA Power Supply
  - LN_2 Cryo-system
- Hg Jet Delivery System (Van Graves)
- Optical Diagnostics (H. Park)
- CERN Infrastructure (I. Efthymiopoulos)
- Simulations (Jian Du)

High Field Pulsed Solenoid





- 80º K Operation
- 15 T with 5.5 MVA Pulsed Power
- 15 cm warm bore
- 1 m long beam pipe

Peter Titus, MIT

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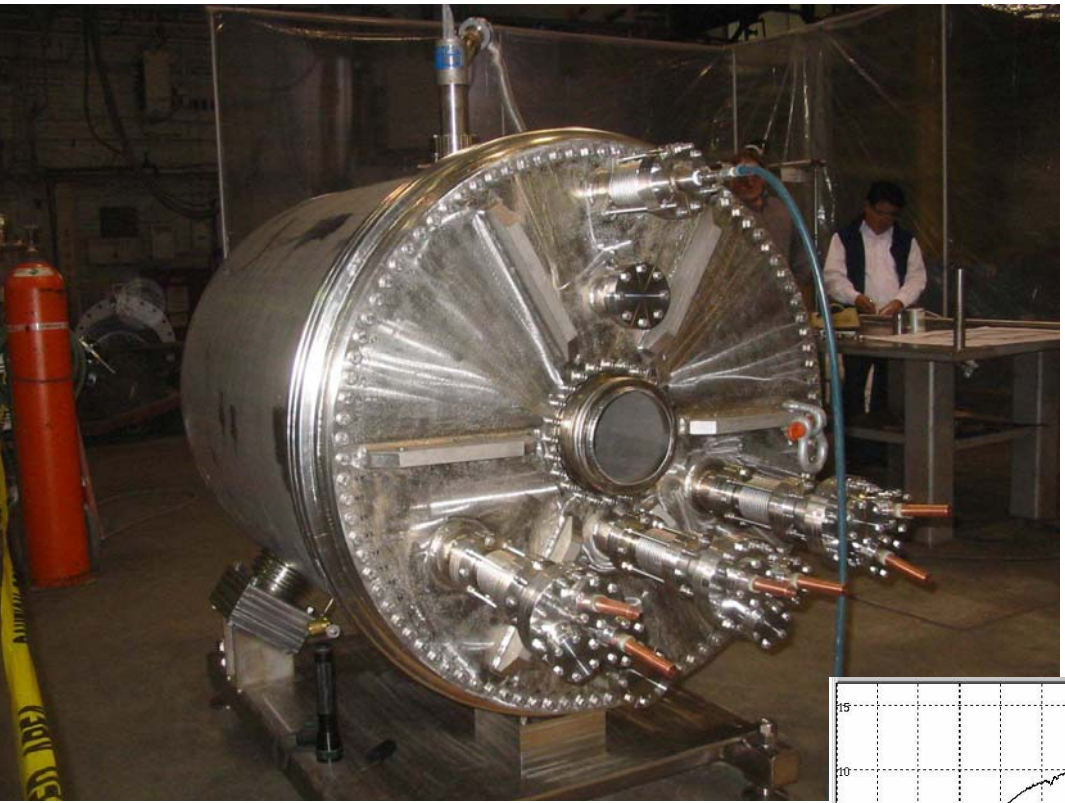
Pulsed Solenoid Milestones

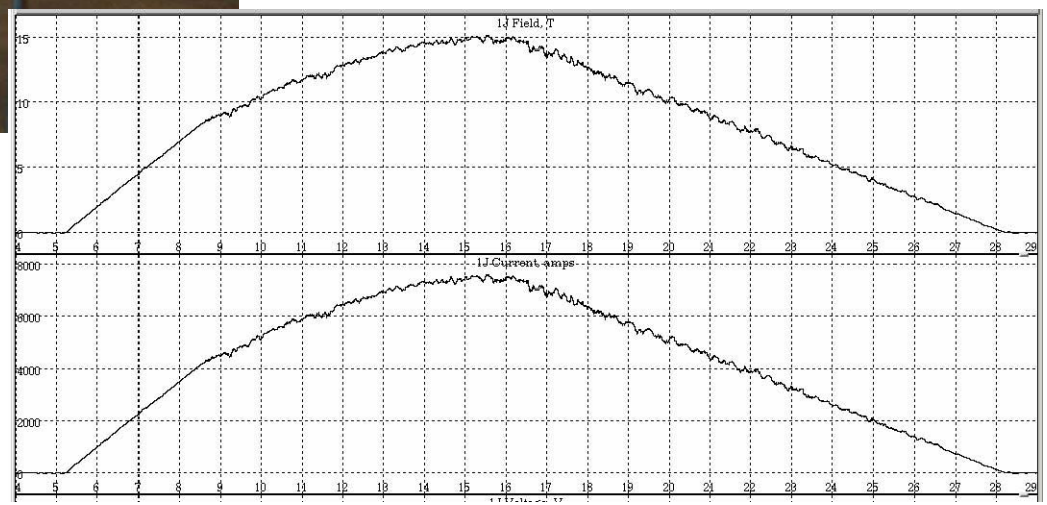
Delivery to MIT	January 06
Reception Testing	March 06
Integration Testing	February 07
Ship to CERN	February 07
Installation at CERN	March 07

The Pulsed Solenoid



15T at MIT March 30, 2006

CVIP December 2005



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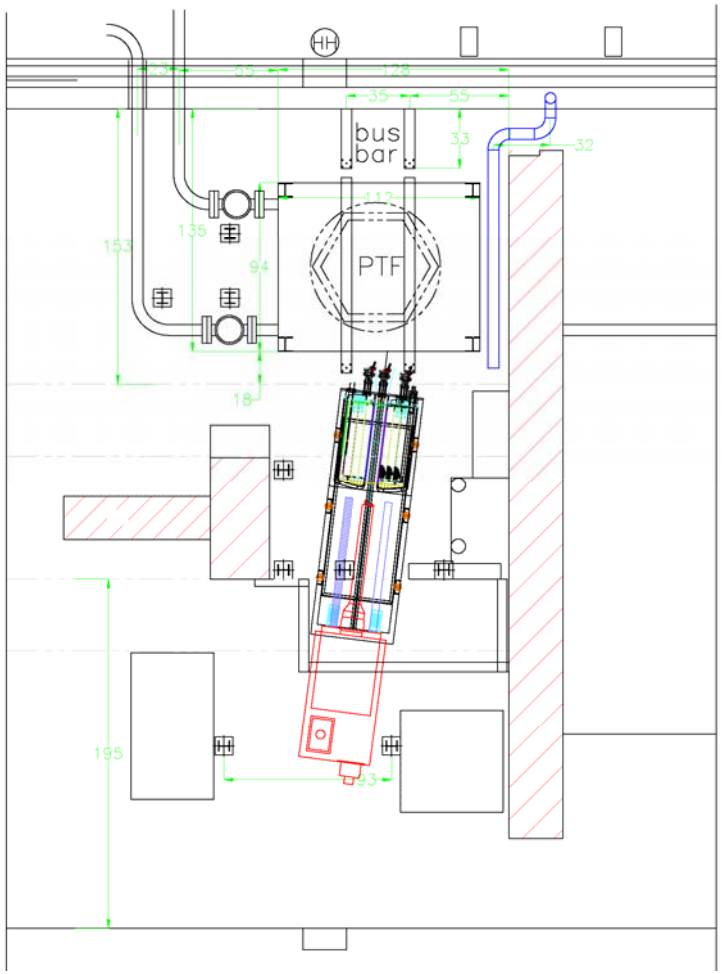
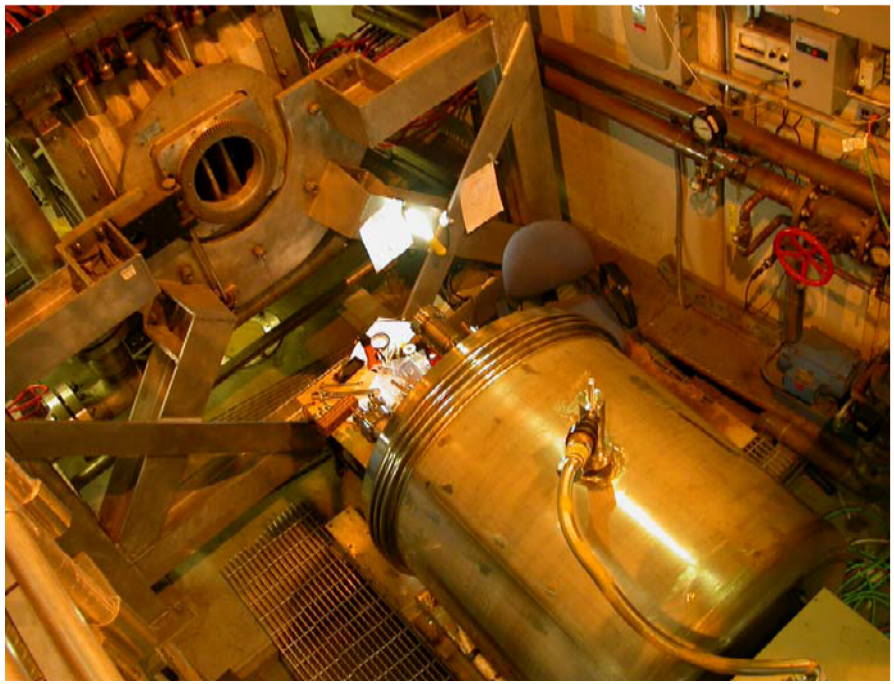
Layout of MIT Integration Test





Pulsed Solenoid in the MIT test pit

Cryosytem Layout

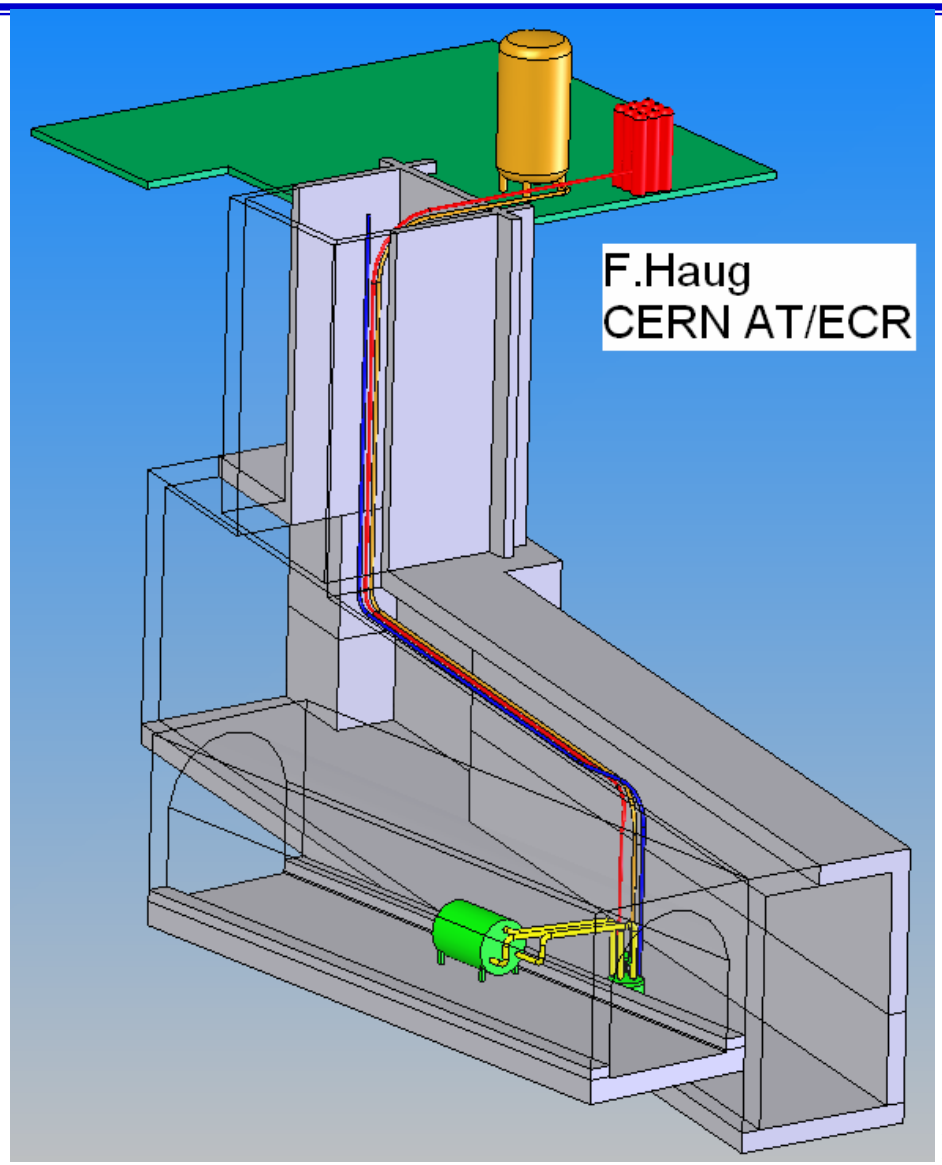
LN_2 and N_2 gas stored on the surface.

Cold valve box in the TT2 tunnel.

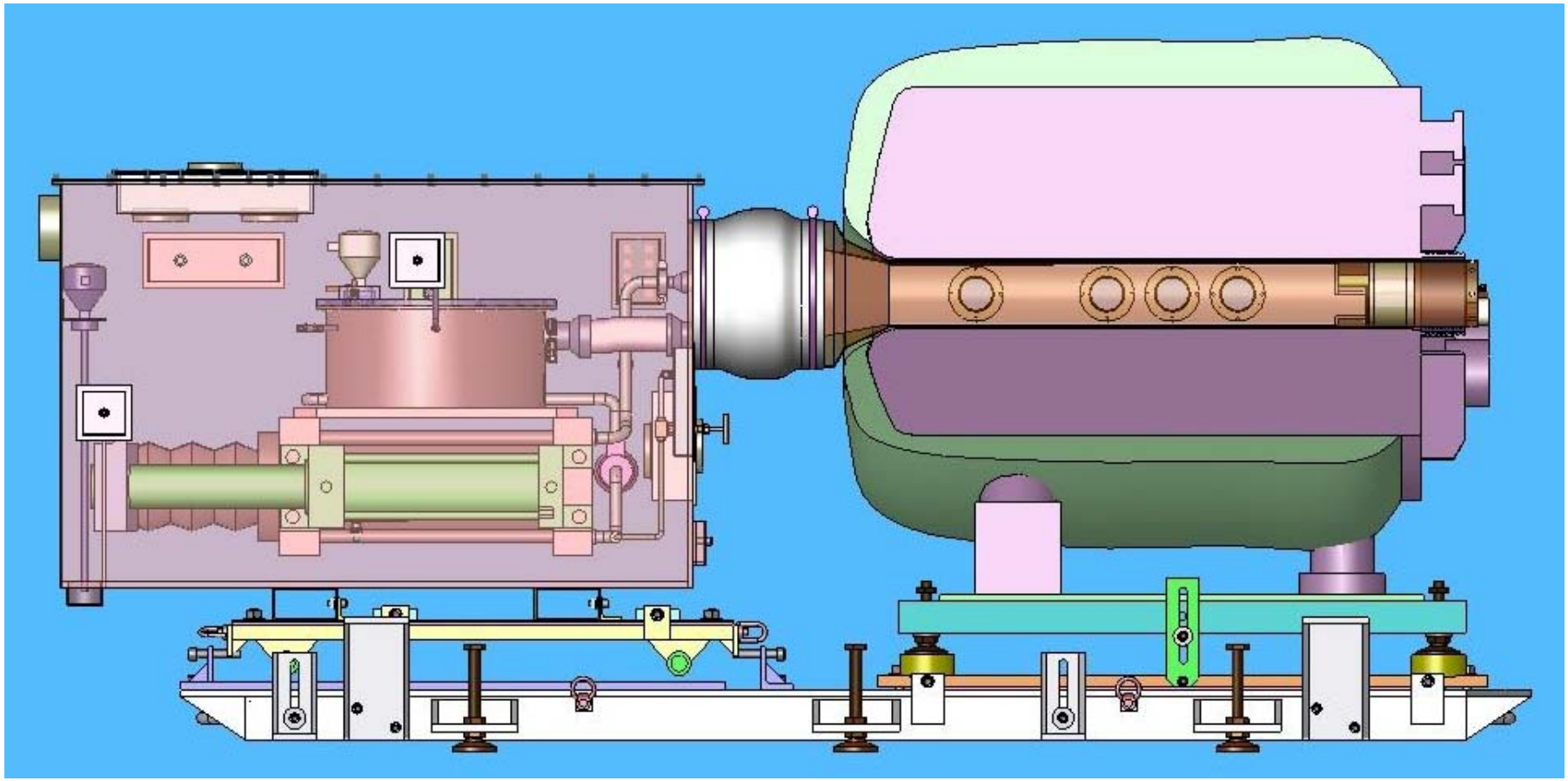
Exhaust gas vented into TT10 tunnel through filtration system.

~ 150 liters of LN_2 per Magnet pulse.

Magnet flushed with N_2 prior to each pulse, to minimize activation of N_2.



The Hg Jet System

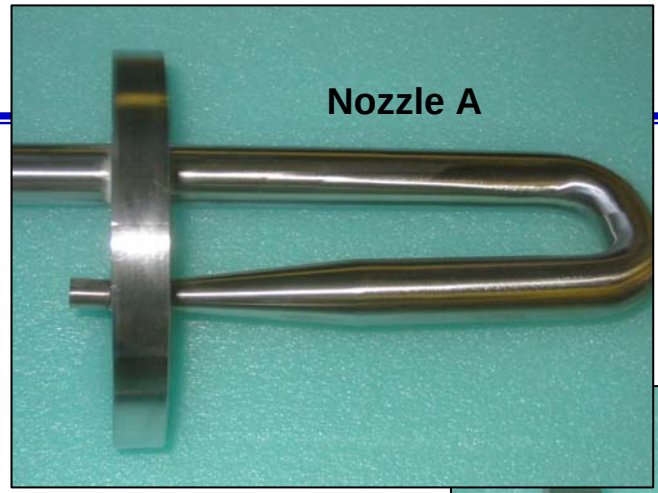


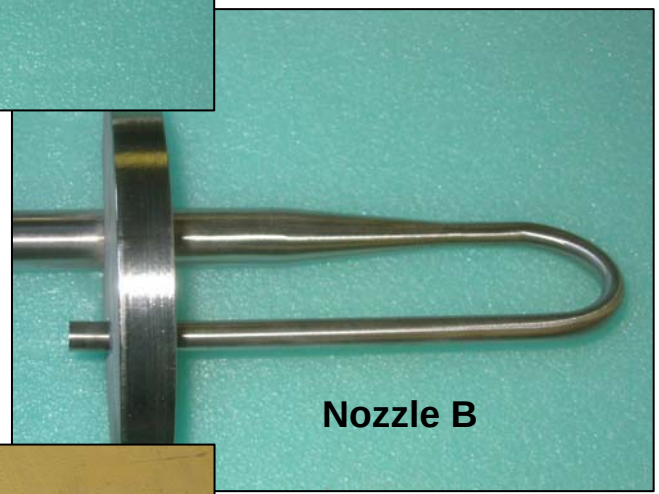
SS Nozzles

Nozzle A – diameter reduction after bend, 2.5° nozzle angle

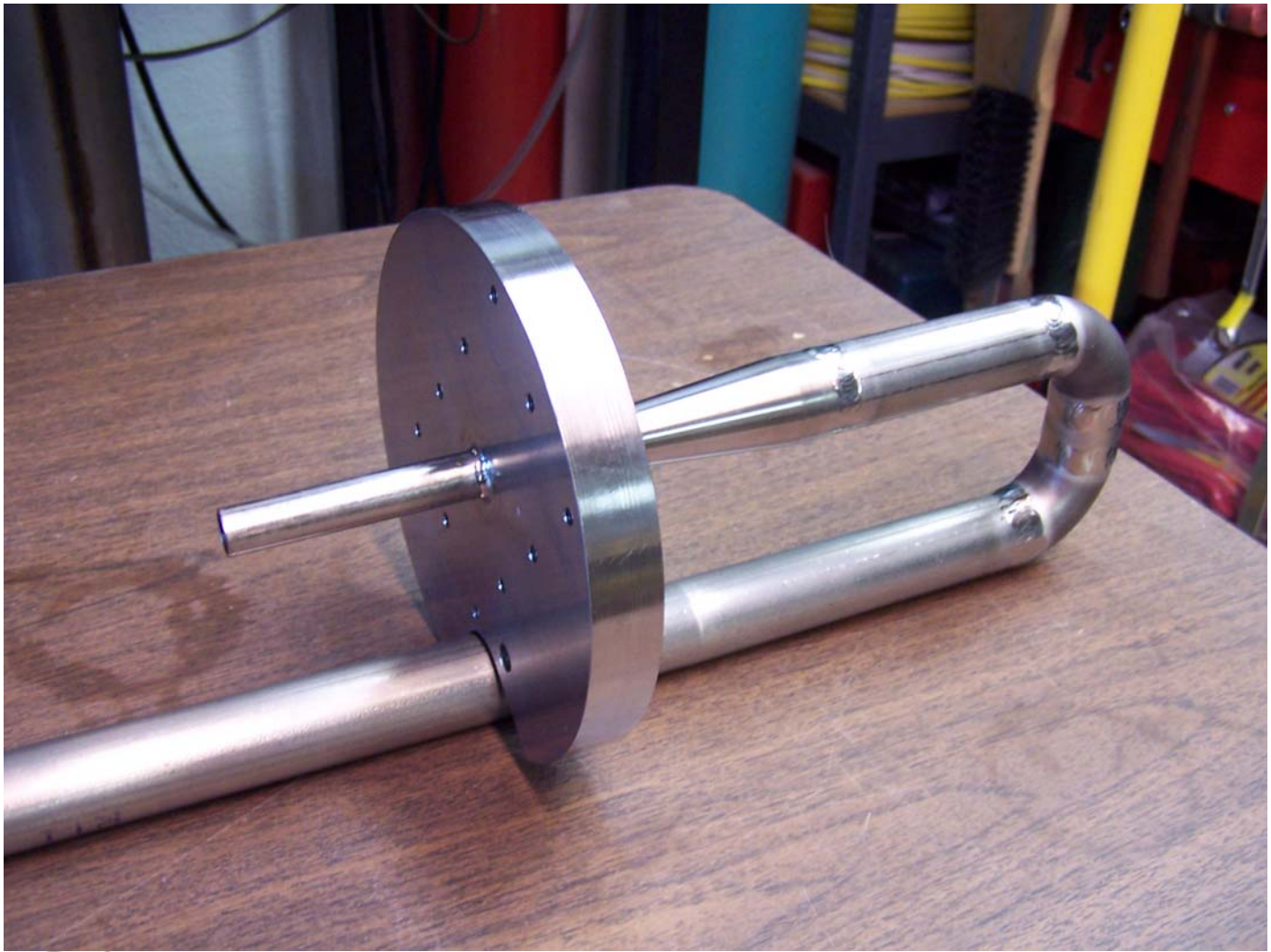
Nozzle B – reduction before bend, 2.5° nozzle angle

Nozzle C – test nozzle with reduction after bend, straight nozzle tip, internally similar to nozzle A





The Princeton Ti Nozzle



The Princeton Ti Nozzle (cont)