nTOF11 Hg System Design Status

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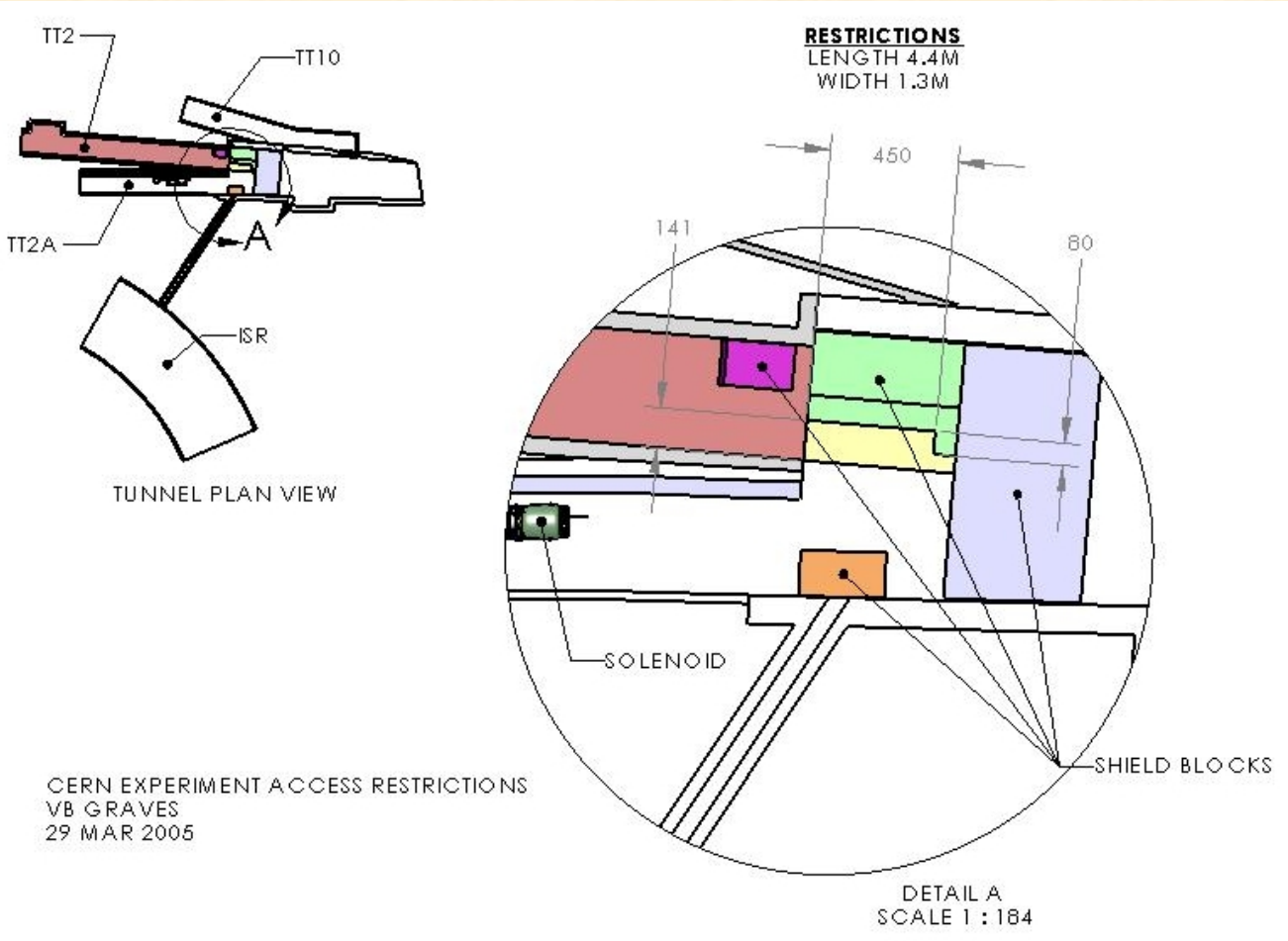
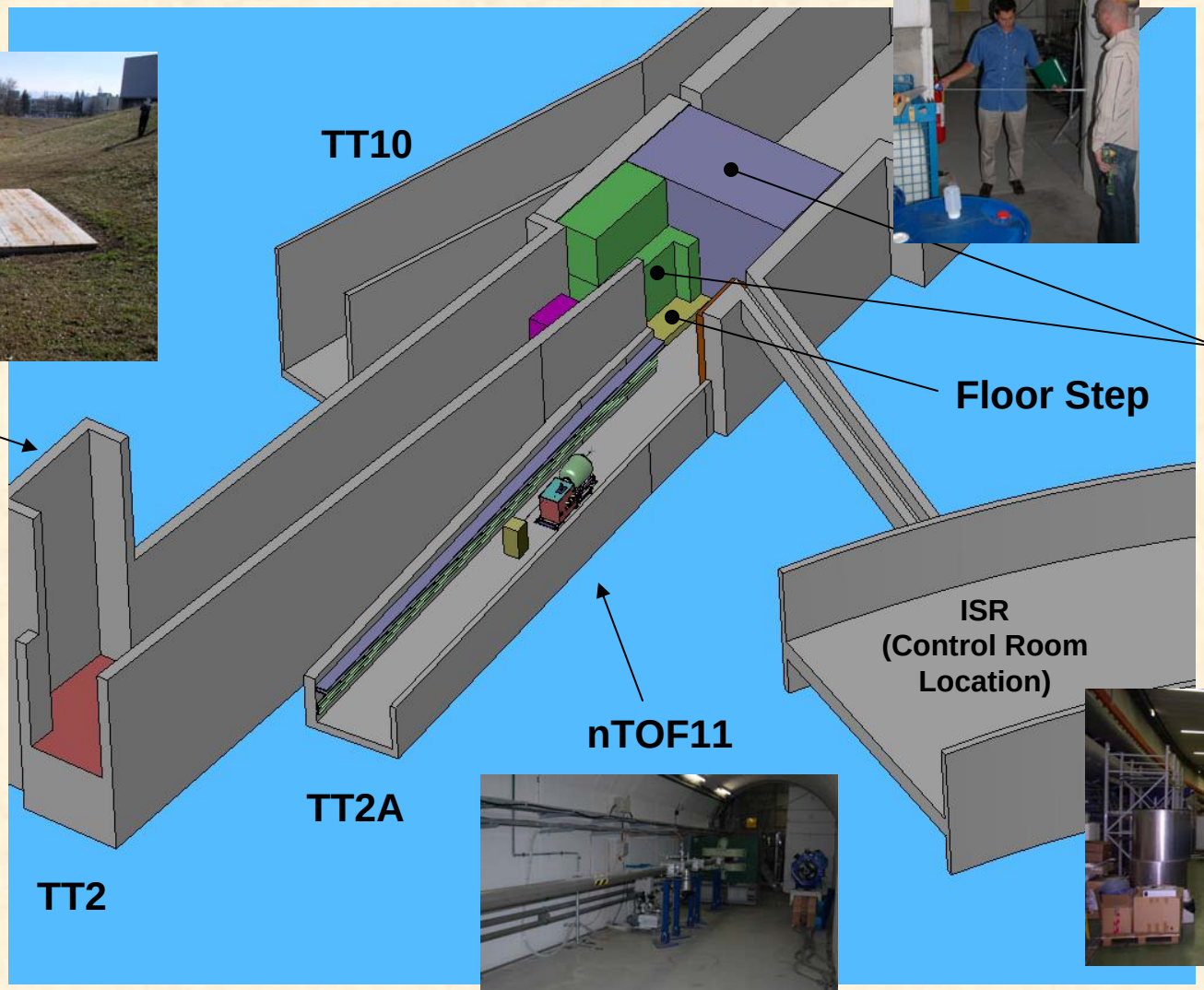
OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

Access Restrictions

- **Prior to CERN trip, assumed component footprint restriction was 1.3m X 3m**
- **Measurements indicate additional length available**
  - **New size restriction 1.3m X 4.4m**

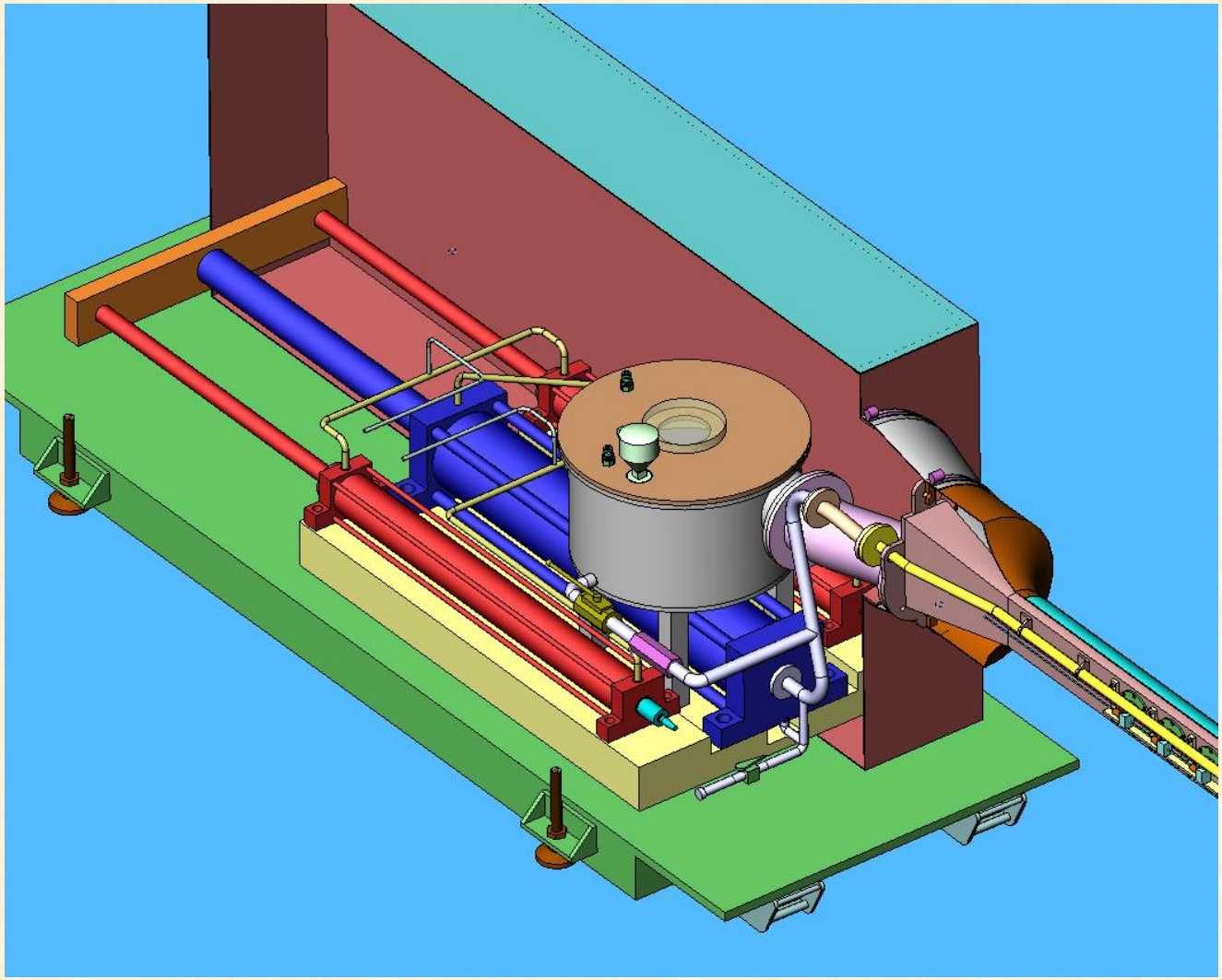


Experiment Layout



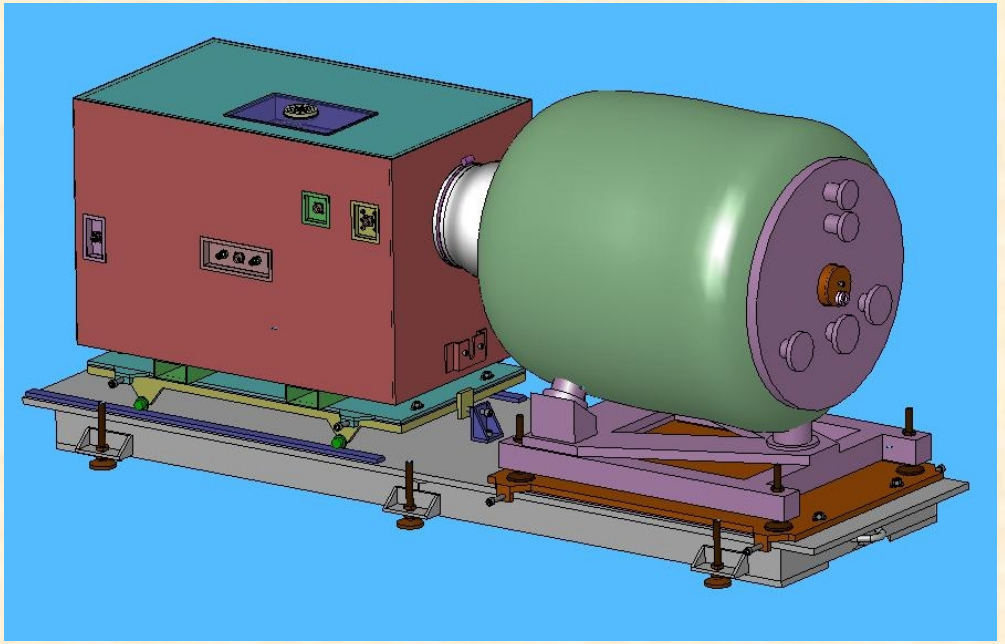
Baseline Concept Presented at Berkeley Collaboration Meeting

- **Hg piston pump actuated by dual hydraulic cylinders**
- **Hg capacity for 20sec jet duration (35 liters)**
- **Hg system length required assembly inside TT2A tunnel**



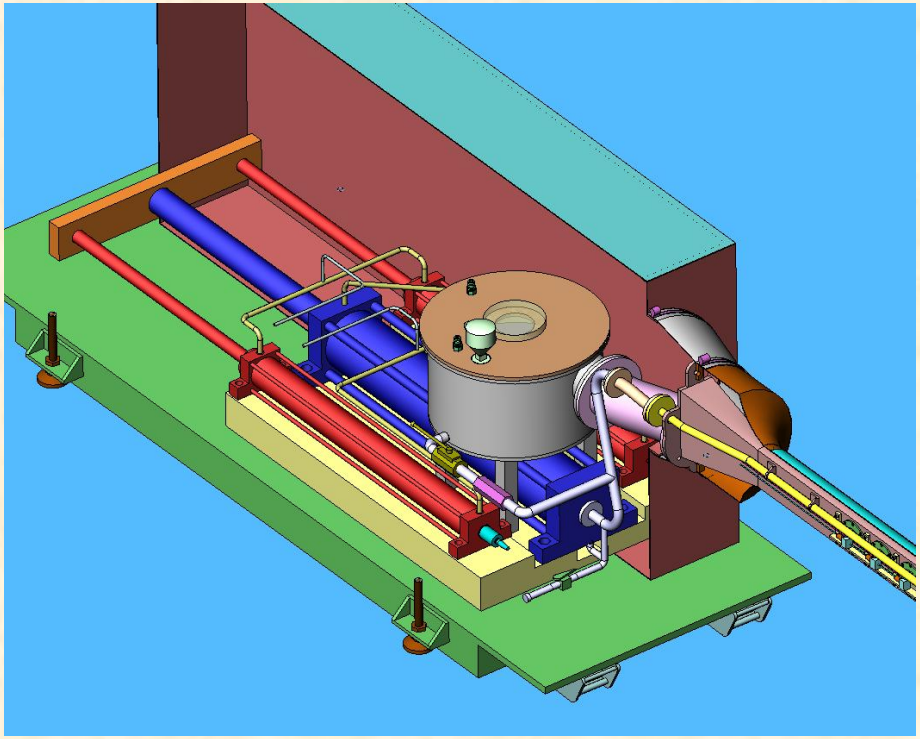
Design Work Since CERN Meetings

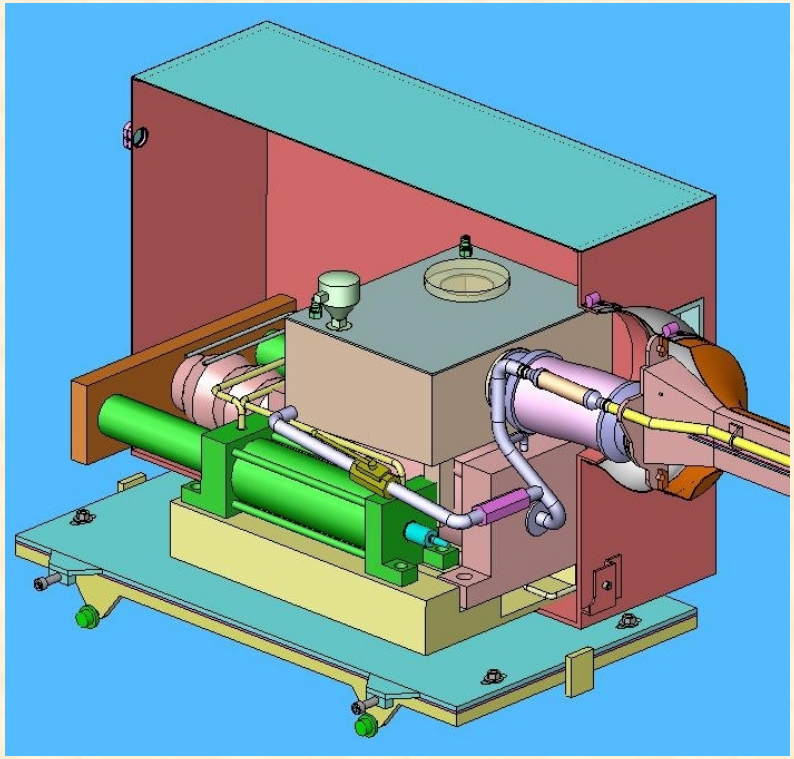
- **Pistons resized to eliminate in-tunnel assembly of target module**
- **Hg jet duration decreased from 20sec to 12sec**
  - **Maximum volume required decreased from 35 liters to 23 liters**
- **Baseplate reconfigured to stay within facility size constraints**
- **Target/solenoid integration details**
  - **Hg delivery system size reduction**
  - **Target cart design optimization**
  - **Magnet base support**



Hg Delivery System

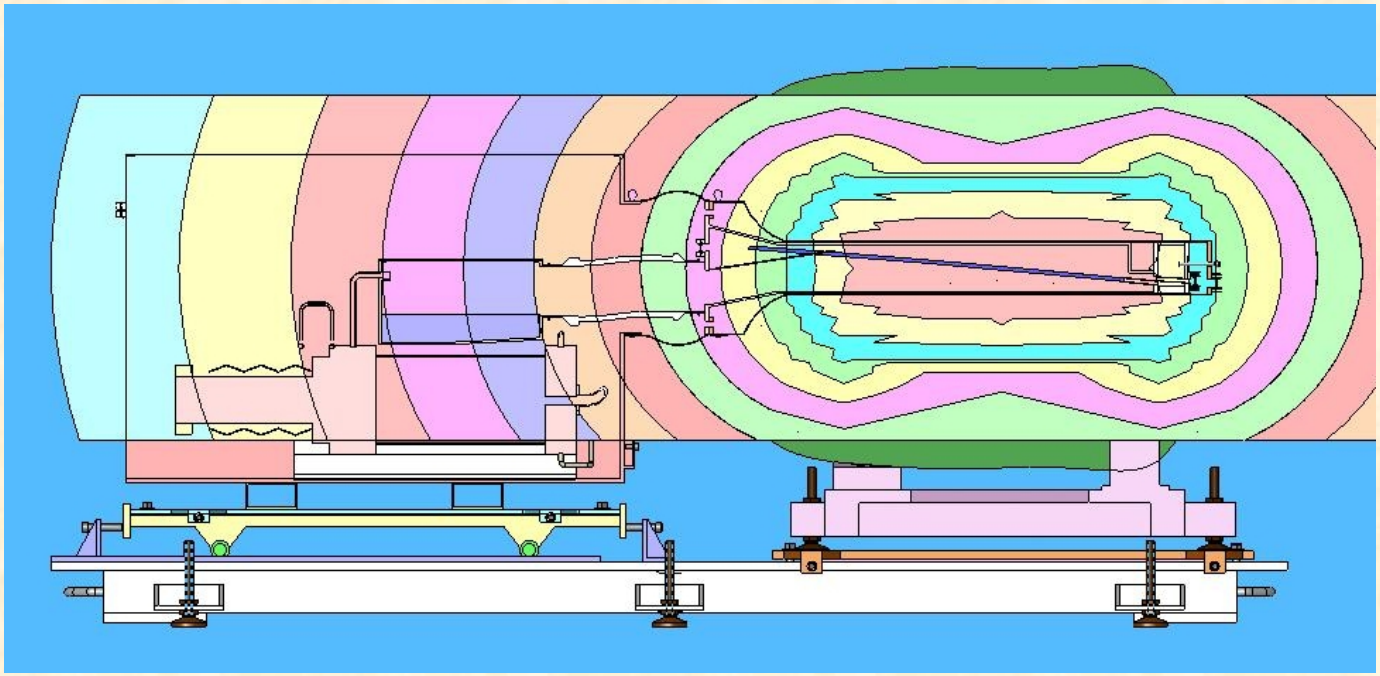
- **Reduced length**
- **Changed sump design**
- **Refined cart details**





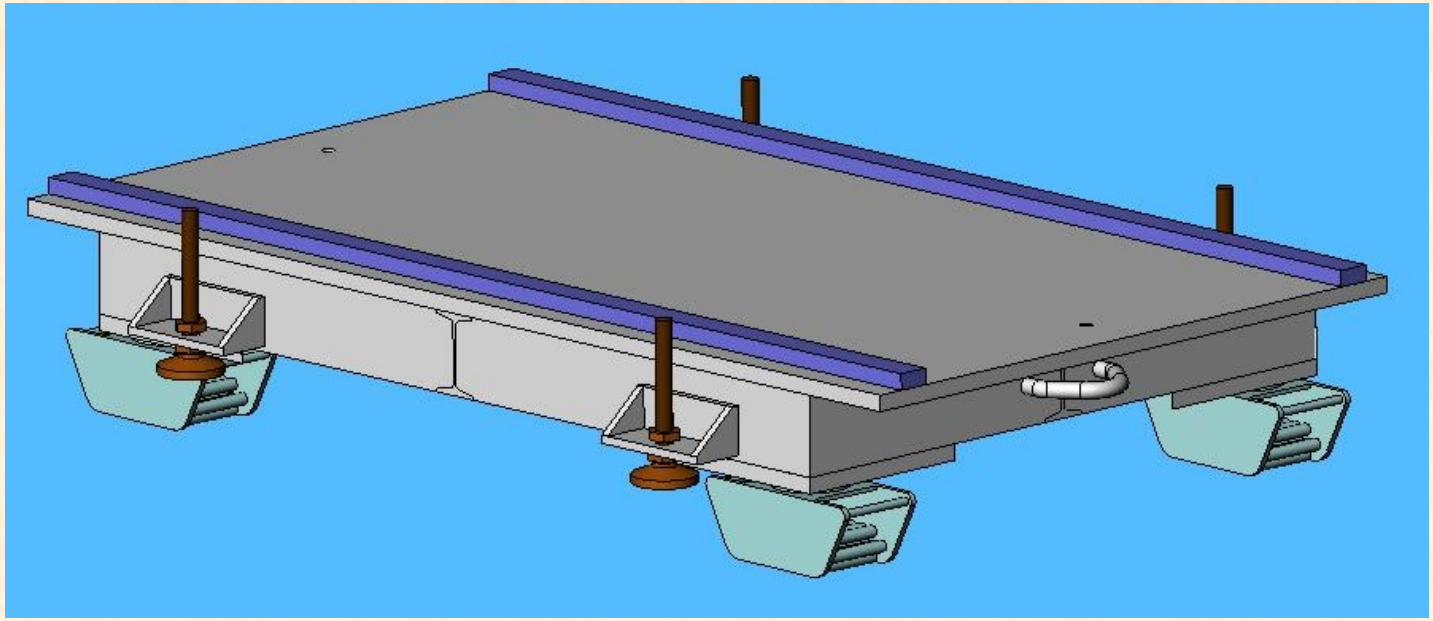
Stray Field Effects

- **Initial discussions with ORNL Fusion Division engineers indicate stray fields will tend to pull iron pistons toward magnetic center**
- **Effects need to be quantified**



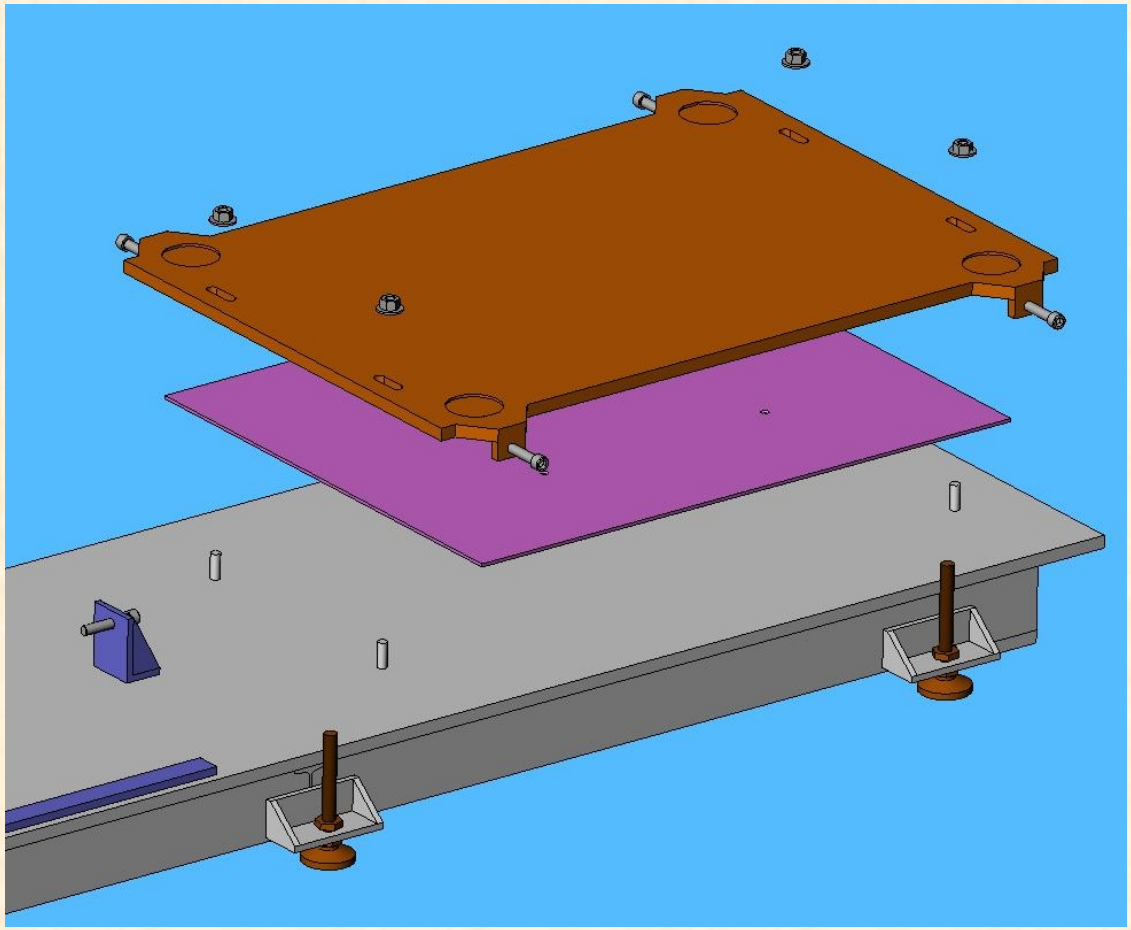
Carrier Baseplate

- **Transports Hg system inside tunnel**
- **Rollers removed once in position**
- **Rails for Hg system cart wheels**
- **Will have mechanism to lock cart in place**



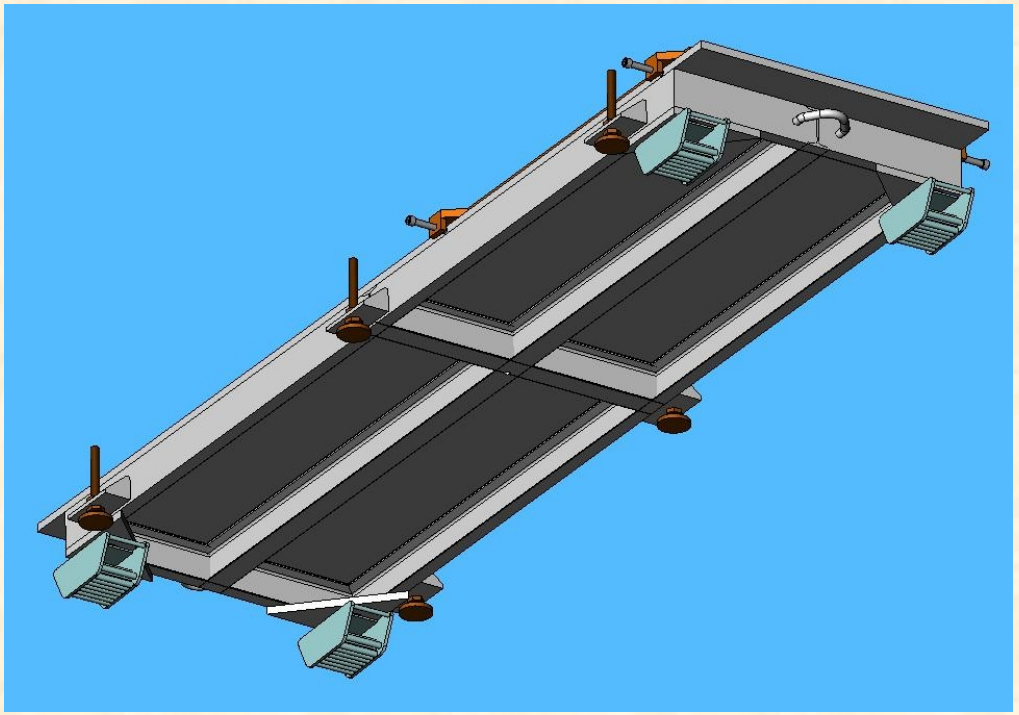
Common Baseplate

- **Same design as carrier baseplate, just longer**
- **Rollers used to grossly align solenoid to beam**
- **Provides lateral movement of solenoid for alignment to beam once rollers removed**



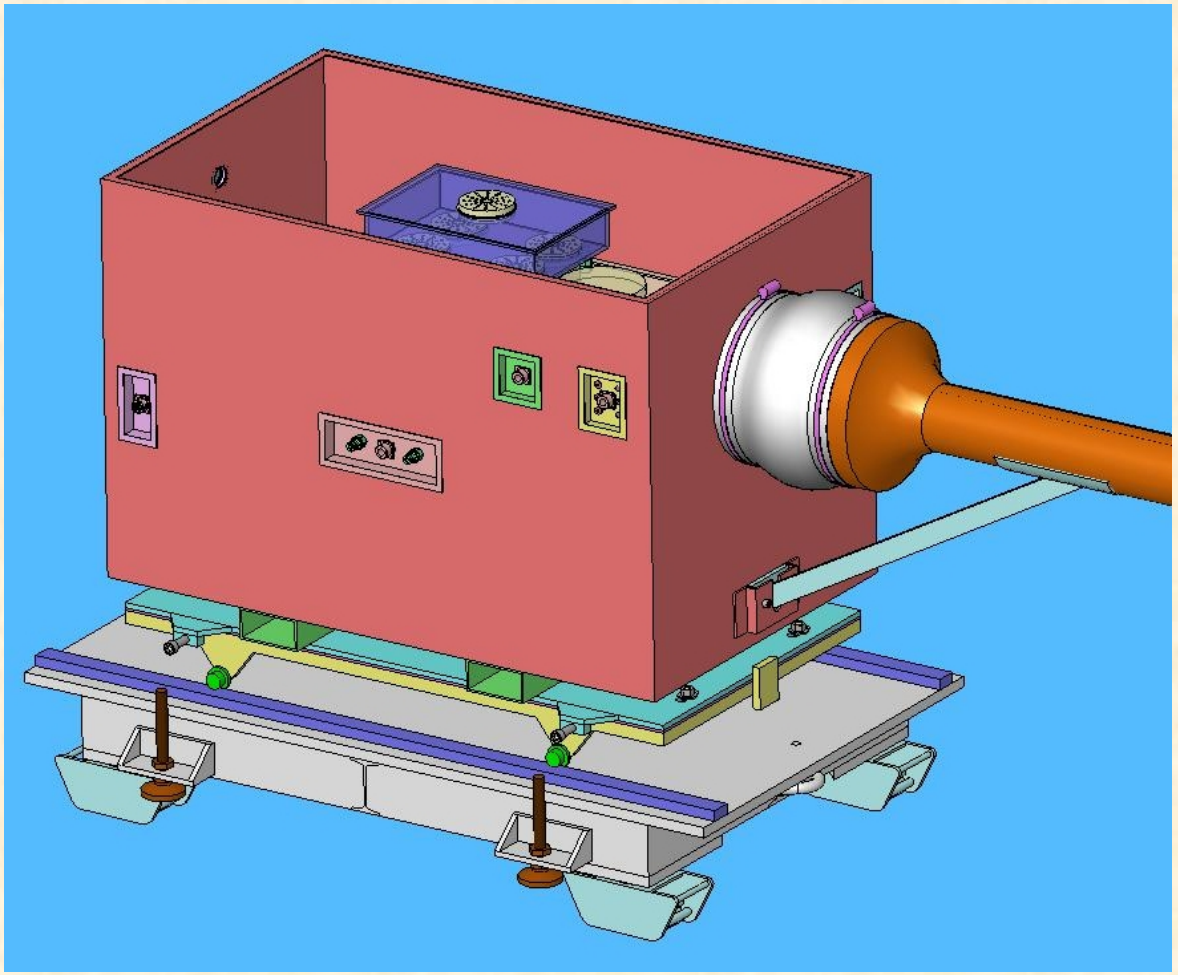
Baseplate Mobility Issues

- **Method needed to remove rollers from baseplates**
  - **Lift from end or underneath?**
  - **CERN/MIT or nTOF11 provide?**
- **How to interface to CERN "turtle"**
- **How accurately can baseplate be aligned to beam using rollers?**
- **Lifting method TBD**



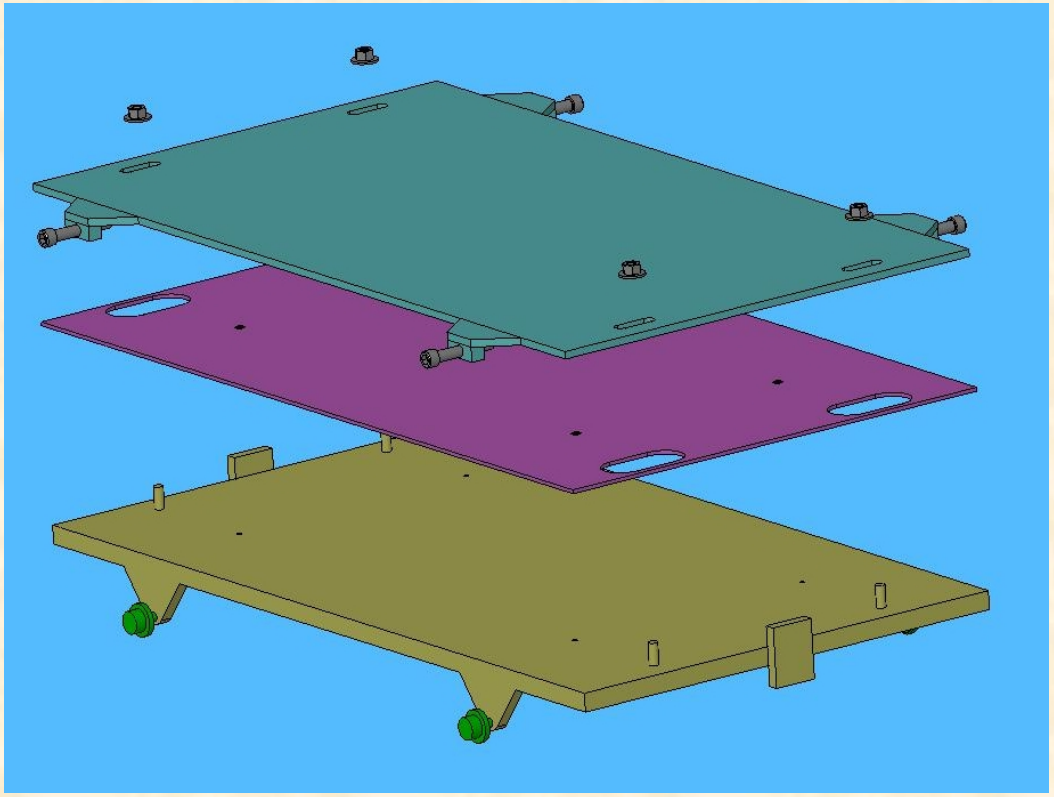
Target Cart Design

- **Hg system shipped on cart and carrier**

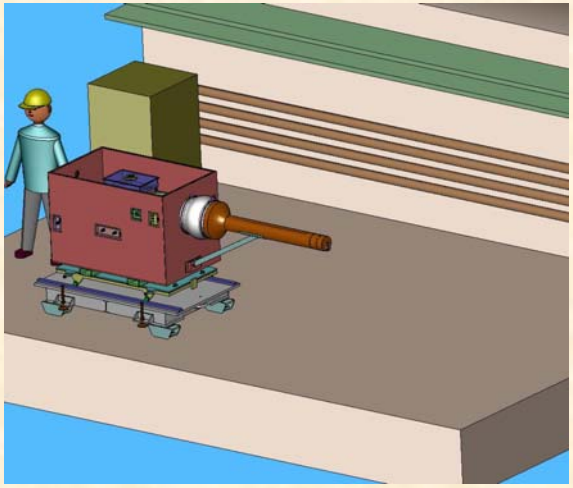
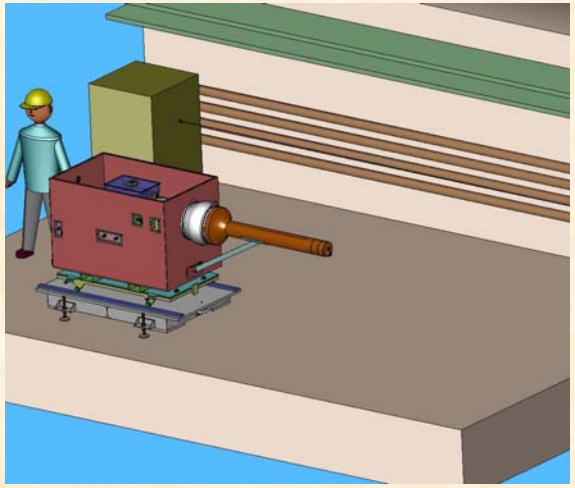
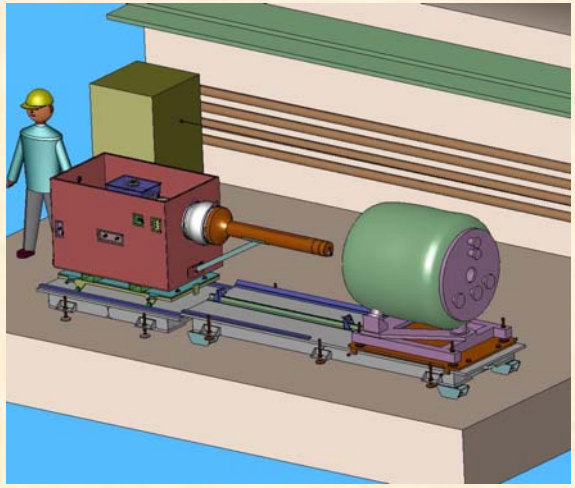
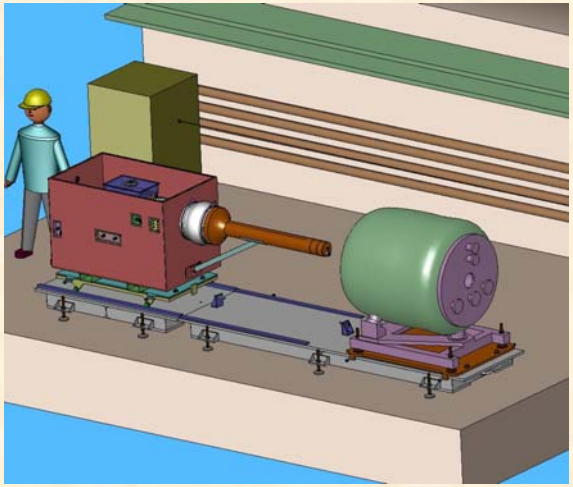
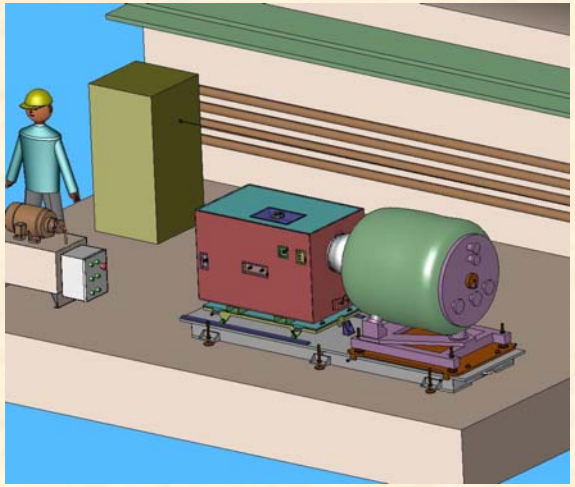
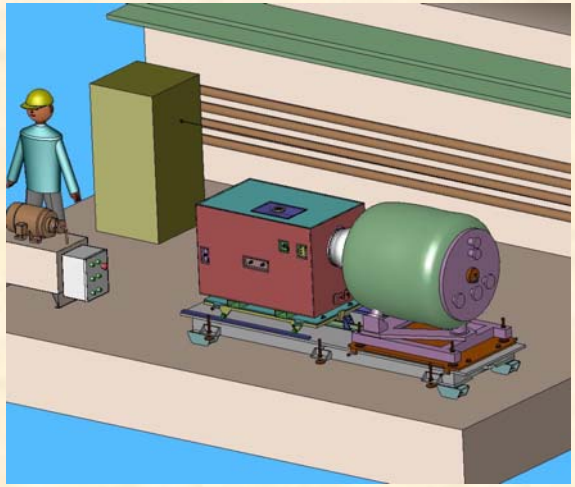


Cart Details

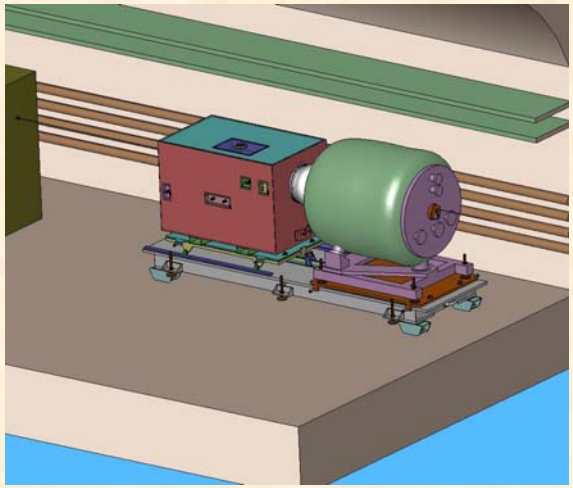
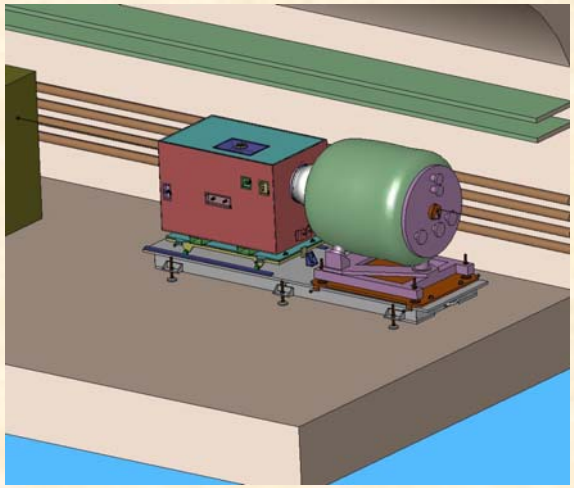
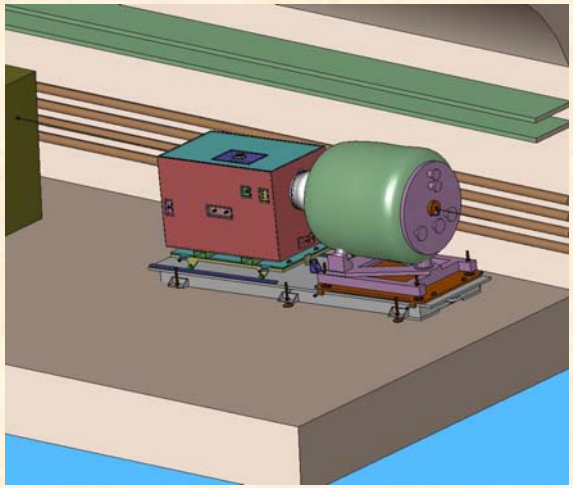
- **High capacity track rollers can withstand vertical & side loads**
- **UHMW sheet provides sliding surface for lateral movement of Hg system using jackbolts**
- **Hg system fixed to top plate, final position locked using nut/bolt**



Installation Sequence Part 1 (Out-of-beam)

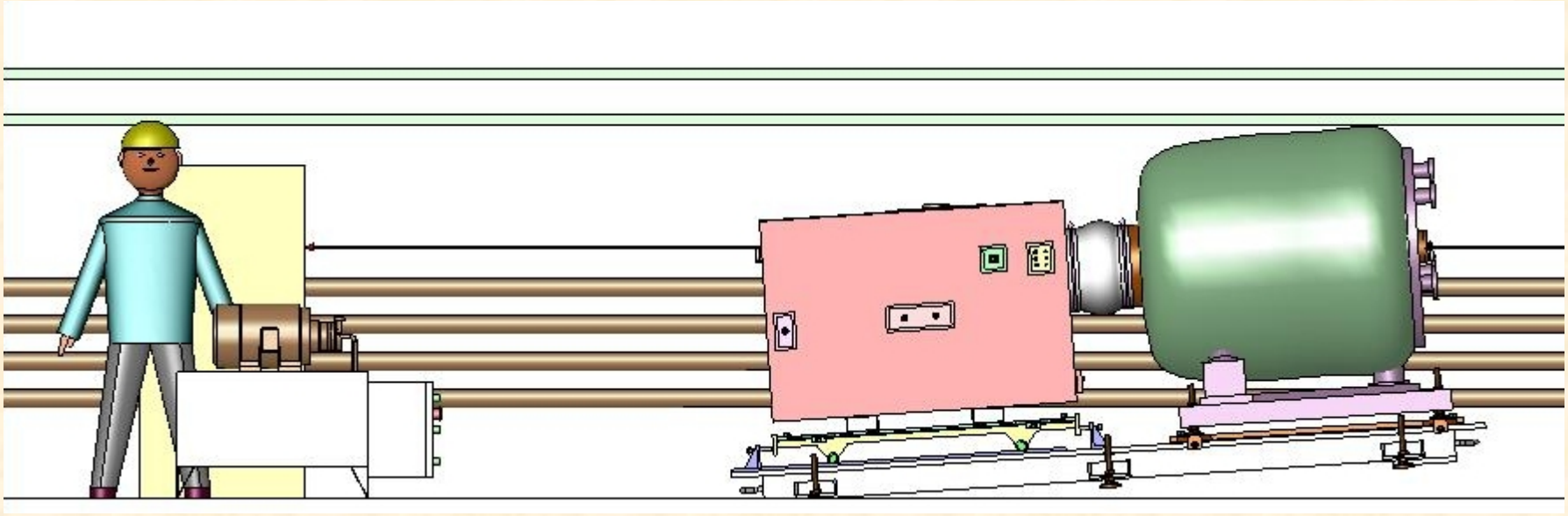
Installation Sequence Part 2 (In-beam)

- **Common baseplate can go in beam line prior to Hg system install if beam attenuator is far enough away**
- **Hg system pulled onto common baseplate using strap winch**
- **Jacking system needed to remove rollers**
- **Blocks under leveling feet to provide adequate elevation**

Baseplate Still Too Long

- **Adding sliding plate and leveling jacks under solenoid has pushed baseplate closer to floor**



Alignment Adjustments

- **Nominal nozzle position relative to secondary containment will be measured at ORNL**
- **CERN beam locating devices should precisely position system relative to beam**
- **Propose using initial beam shot(s) to refine jet position**
  - **Optical diagnostics will show beam/jet interaction location**
  - **Cart lock plates have jackscrews to provide fine adjustment of target insertion depth**
  - **Lateral adjustment of magnet & Hg system also available**

Current Design Issues

- **Length optimization**
- **Baseplate interface with CERN "turtle"**
- **Lifting methods, lift points**
- **Stray field effects on pistons & cylinders**
- **Beam alignment details**

Remaining Work

- **Lateral restraints**
- **Winch assembly**
- **Alignment fiducials**
- **Replaceable nozzle**
- **Plenum optimization**
- **Beam window integration**