UT-BATTELLE

High Power Hg Target Conceptual Design Review

Operating Scenario / Hg Handling / End-of-Test Handling

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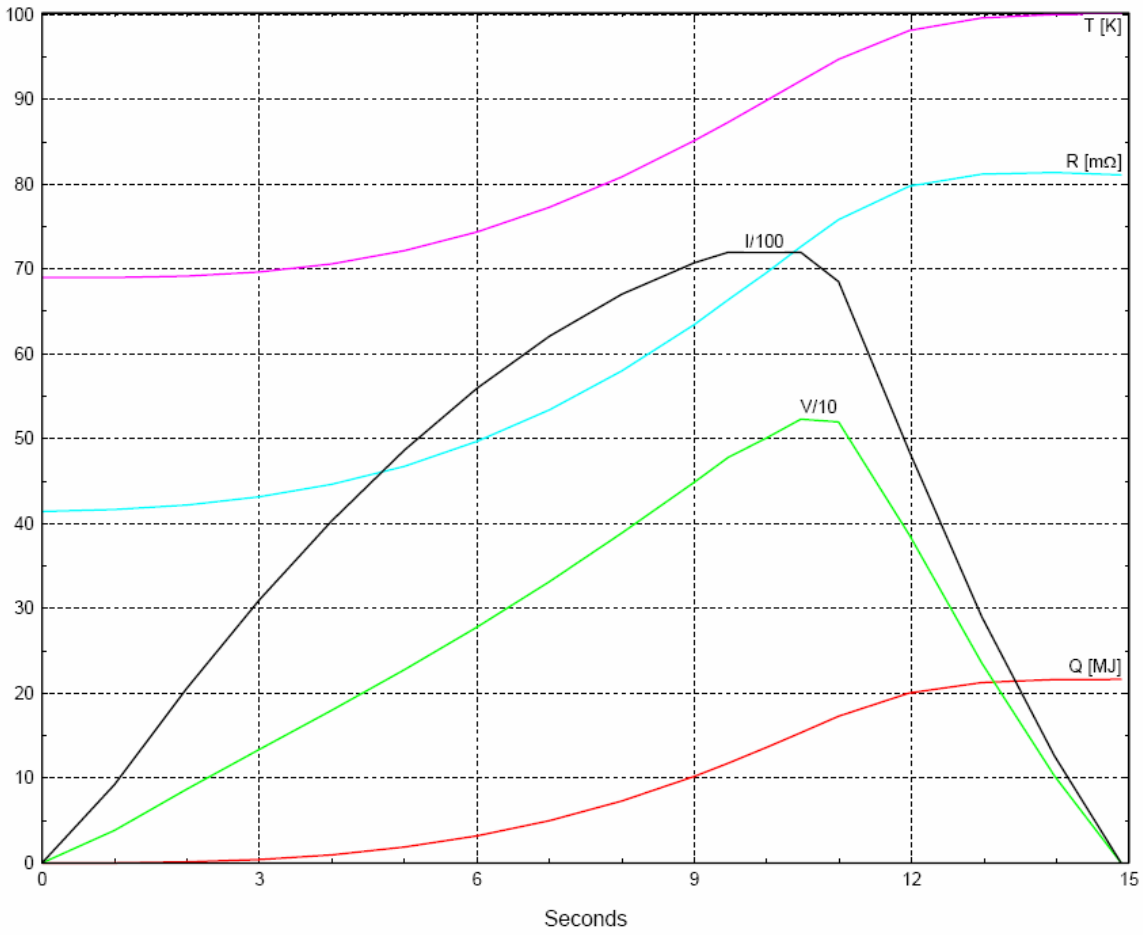
Preliminary Hg Target System Operation – Full Field (15 Tesla)

Time (sec.)	Solenoid **		Target Pump System	Proton Beam	Optical Diagnostic
	Cryogenics	Power Supply			
minus 30	Magnet full of LN_2 @ 80ºK	Standby	Fill Hg supply line	Call for beam	Off
minus 10	Purge LN_2 with gaseous He	Standby	Standby	Wait for beam	Standby
0 to 9.5	Magnet full of He gas	Start ramp to full current	Ramp Hg to full flow	Wait for beam	Standby
8 to 9.0	Magnet full of He gas	Ramping to full current	Steady state Hg jet	Wait for beam	Turn on laser lighting
9.5 to 10.5	Magnet full of He gas	At full current	Steady state Hg jet	24 GeV, 1 MW	Operate high speed camera
10.5 to 11.0	Magnet full of He gas	Begin de-energizing	Shut down syringe pump	Standby	Turn off laser light and camera
11.0 to 15.0	Magnet full of He gas	De-energize to zero	Standby	Standby	Off
15.0 to 1800.0*	Fill magnet with LN_2 @ 80ºK	Cool down to ~80°K	Refill syringe cylinder	Standby	Off

* Assumes a 30-minute dwell period.

** Solenoid power supply is in “Standby” for zero-field operation.

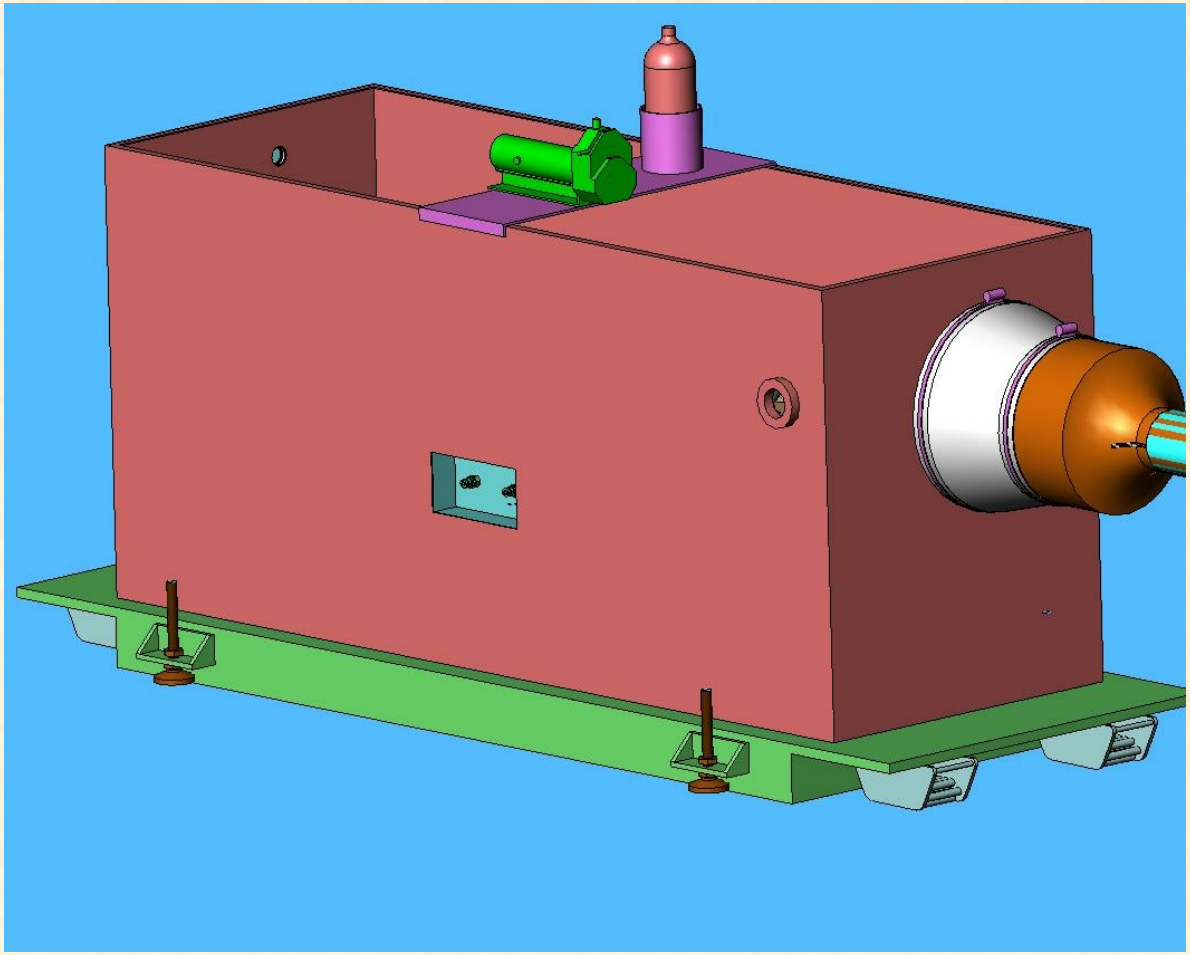
Magnet Operating Scenario



Bob Weggel's 10-14 analysis of the LN2 magnet operation

Plan For Handling Hg

Peristaltic pumping is considered to present the least risk of spillage for installing Hg



Hg Handling (cont.)

- **Install and remove Hg with a peristaltic pump**

Hg Handling (cont.)

- **Use spare Hg from the TTF inventory (new Hg is ~$600 liter) … ??**
- **Ship in 2-liter flasks**
- **Recover virtually all Hg at the end of tests; return the Hg to ORNL**

Residual Radiation On Solenoid & Target Equipment (H. Kirk MARS Calculation)

- **Assume:**
  - **200 pulses**
  - **16 x 10^{12} protons/pulse average**
  - **30 days running**
- **Then the contact radiation on the iron exterior will be:**
  - **After 1 hr 40 mrad/hr**
  - **After 1 day 21 mrad/hr**
  - **After 1 week 13 mrad/hr**
  - **After 1 mo. 5 mrad/hr**
  - **After 1 year 1 mrad/hr**

Residual Radiation In Hg (H. Kirk)

- **Assumptions:**
  - **200 pulses**
  - **16×10^{12} protons/pulse**
  - **4 weeks exposure time**
  - **24 GeV proton beam**
  - **1 cm diameter – 30cm long Hg target**
- **After 1 sec: 2.5 Curies**
- **After 1 month: 4.3×10^{-3} Curies**
- **After 1 year: 4.9×10^{-4} Curies**

End Of Testing At CERN

- **After last pulse, leave equipment in place for 1-2 weeks**
- **With minimal dismantling in situ, move equipment out of beam line**
- **Leave in tunnel area as long as CERN permits, up to 1 year … ??**