Summary Notes for the Hg Target Title I Design Review
February 7-8, 2005
Oak Ridge National Laboratory

Because of the limited time I had to get these notes sent out, they may appear somewhat disjointed. But I have attempted to categorize them and identify the items that should be discussed in some detail during our teleconference on Wednesday, Feb. 9, at 5:00 p.m. EU time (11:00 a.m. EST). Those items are colored in blue.

Miscellaneous

1. Roman is doing an MHD analysis to determine the jet position for high magnetic field and zero field operations, and will report results at the Berkeley meeting on Feb. 16.
2. The imaging-fiber bundle (Schott) is limited to 4.5 meters in length and cannot be spliced; hence, the imaging system must be “close” to the experiment, i.e. the CCD camera and computer.
3. The schedule should be revised to include a longer Title II design period, detailed design of the nozzle and fabrication after results of the Princeton tests are available, and procurement at the start of FY 2006; is December 2006 for testing unrealistic?
4. **Plan a meeting at CERN during the week of March 14, 2005 for the purpose of: a) inspecting the TT2A tunnel and the route for equipment transport, and b) resolving all issues that deal with safety, operations, and decommissioning that will influence the target design.**
5. A systems integration task is needed to coordinate the requirements of each subsystem for operating in coordination with a beam pulse; LabView® was discussed as a possible common platform.
6. The cylinders are long lead items requiring approximately 16 weeks for delivery; add redundant vapor monitor(s), cabling, and miscellaneous hardware to the cost estimate.

Nozzle Issues

1. The jet should be adjustable to accommodate zero field and lower velocity; hence, the nozzle/plenum must be replaceable or adjustable in situ; these final adjustments can only be made during the high field tests at MIT.
2. The opening in the plenum behind the nozzle region must be shaped to match a flow-velocity profile to avoid vena contracta effects.
3. The diameter of the plenum should be at least three times the nozzle diameter.
4. Proposed tests at Princeton may be too late to influence the nozzle design and the “catcher” plate configuration; a minimum of two months is estimated before results are available. Therefore, reconsider the design philosophy: address all of the issues raised, proceed with the design, procure long lead items, fabricate all components except the nozzle/plenum.

Design Issues

1. May need a “primary enclosure” bellows on the “blue” cylinder.
2. Use double seals in the cylinders.
3. Write a procurement plan.
4. The solenoid base structure will have the positioning fiducial marks.

5. The “warm bore” heater is needed only on the 20-cm region near the upbeam end of the solenoid.
6. Use 6061 aluminum for base support structure.
7. Investigate axial loading on flex lines under 1000 psi.
8. The diagnostic spherical mirrors will be precisely positioned when they are installed at ORNL; this operation will not impact the assembly of the target cassette.
9. The optical diagnostics, the windows, lenses, and reflecting mirrors, must be installed before the Hg supply line is assembled to the primary containment box.
10. Move the diagnostic penetration to the other side of the secondary containment.
11. Size the system for the 12-inch diameter cylinder and 12 seconds of Hg.
12. Consider shipping the target system with a shorter, temporary secondary containment.
13. Consider adding the ability to observe side-displacement of the mercury jet and assess the design impact.
14. Add a “membrane” window in front of the “through tube” in the upbeam region in front of the plenum to prevent the possibility of Hg collecting in front of the primary window.
15. Consider using “clean” Hg for ORNL and MIT tests, drain, ship to clean and empty, and ship “other” Hg to CERN.

Facility Issues

1. Verify the proposed distance between the beam absorber in the tunnel and the magnet: 3 meters?
2. Verify that the equipment to be installed in the tunnel is limited to 3 meters of length for transport from above ground to the TT2A tunnel, and that 4 meters will be available at the experiment.
3. Confirm that lifting in the TT2A tunnel is limited to 2000 kg.
4. The need to protect peripheral/auxiliary equipment from radiation damage, and unnecessary activation will require installation through a wall into the adjacent tunnel, or local shielding around these components.

Safety Issues

1. What are the transportation requirements for the target system with and without Hg installed, for domestic and international shipping?
2. Can the system be shipped and received with Hg installed?
3. Consider evacuating the system for the initial filling of Hg at the TTF; can the system be shipped with Hg installed in the sump tank?
4. Can the secondary containment be opened in the CERN tunnel?
5. Can the primary containment be opened in the CERN tunnel to assemble the cassette onto the pump interface?
6. Can the primary (and the secondary) containment be opened in the tunnel to disassemble the cassette for decommissioning operations?
7. Can Hg be removed from the target after a radiation cooldown period, out of the tunnel, in a suitable, ventilated area?
8. Will CERN accept mildly activated mercury (from WNR tests) for installation in the target system?

Actions

1. ORNL - send the latest model renderings and key dimensions of the nozzle/plenum region to Roman.
2. MIT – send Van separate solenoid deflection plots for: cooldown, energizing,warm up, pressure.
3. ORNL – provide MIT with baseline geometry for analysis of the impact of magnetic fields around the syringe system, coil leads, etc.
4. ORNL – provide Princeton with the proposed thickness of the “catcher” plate.
5. ORNL – provide BNL with a stray magnetic plot and radiation dose rates in the vicinity of the target.
6. BNL – confirm the present analysis for the beam kick.
7. BNL – provide to ORNL the size (diameter) of the four beam windows, their locations, and the means of attaching them to the primary and secondary containment; also provide detail for the “membrane” window in front of the plenum.
8. ORNL – provide BNL (Thomas and Nick) close up views of the window regions and relevant dimensions.
9. BNL – (Harold) send Van facility drawing that shows the control room region.