6/12 Absorber Review Recommendations & Responses

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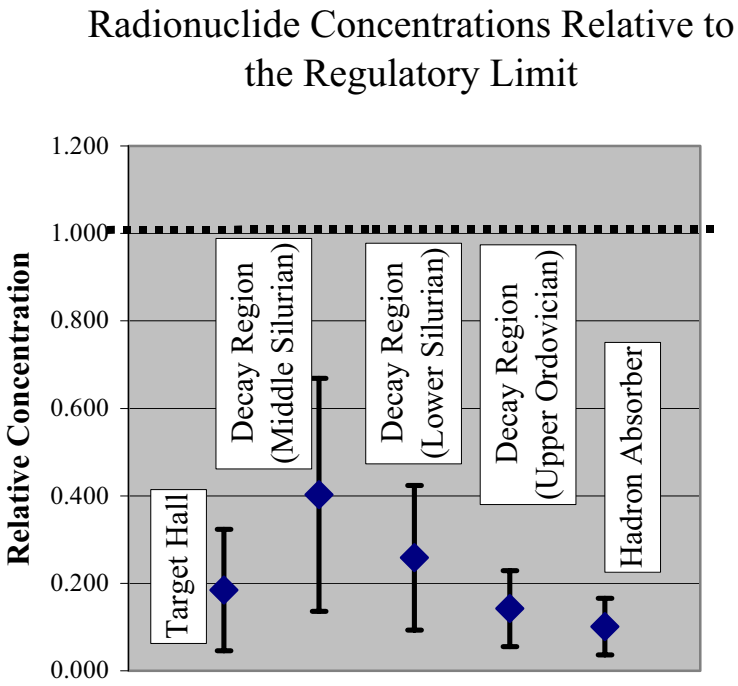
Summary

- This talk will cover the recommendations and comments of the 6/12 Absorber review and will discuss the response to many of them.
- Recommendations/comments were grouped under the headers: *Radiation Analysis, Thermal Analyses, Core Design & Repair/Replacement, Installation Plan, Cost Estimate, Instrumentation and Beam Interlocks, Additional comments, Concluding Remarks*

Radiation Analysis

- *Mars model with current geometry*: see NuMI 779 for star densities (groundwater activation okay); residual activation, air activation, labyrinth source term need more work (underway); RAW activation studied by K. Vaziri



Groundwater--from Nancy, 11/9 (uses result from NuMI Sim-779)

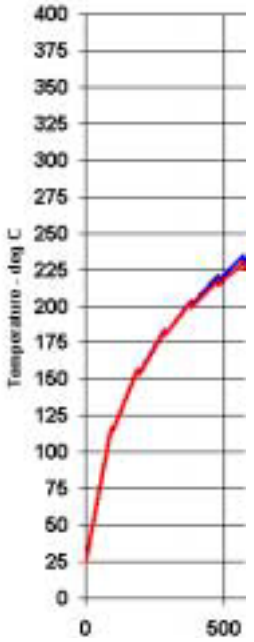
RAW Activation

- The important activities are due to tritium and ^{7}Be. The built up concentration of tritium after one year is below the FRCM recommended limit. With proper precautions, there is no need to replace this water with fresh water during the life of the experiment.
- Note that the amount of ^{7}Be produced after one year of operation is not enough to require shielding for the removed DI bottles.
- the amount of hydrogen produced due to the operation of the Hadron Absorber RAW system is very small. A simple vent to the exhaust stacks should be sufficient to purge the tank.

from Kamran's 11/15 note

Radiation Analysis

accident condition: loss of water cooling just as important as errant beam, combination unlikely, many ways of detecting both; if both, see 50 °C temperature jump in module #4 in one minute—easily detectable with RTDs



from ANSYS study by R. Wands, full 400 kW beam intensity striking absorber

Other monitors sensitive to beam missing target: target Budal monitor, temperature on upstream baffle, muon monitor DS of absorber, BPMs ahead of target

Radiation Analysis (con't)

- *Cracks*: E.V. has staggered steel, concrete to minimize cracks; Igor Tropin has studied cracks for Target Hall; Target hall mockup with Duratek blocks was performed in Meson Detector Building
- *Secondary Containment:* sheet metal containment under core, drain pipe to 55 gallon drums; drums will have piping to allow pump-out from a distance; drums and piping not yet on a drawing; no secondary containment for RAW system pipes

Tgt Hall Mock Pile

5/15/01 picture

Drawing 8875.126-MD-406323 shows some crack dimensions. In case "A", opening at butt joint between 2 blocks was 1.75" at top. For case "B", where four blocks touched at the top, a circular gap of .25 → .75" diameter existed. For case "C", where four blocks met on one side, the vertical and horizontal gaps ranged from 0 to 0.5".

Height of 3*52 +26 (182 nominal) was 182.8", height of 2*52 + 2*26 (156 nominal) was 156.3".

Thermal Analyses

- *discrepancy between R. Wand's study of flow of 50 gpm per one module and RAW system capacity of 70-80 gpm total for 8 modules*: ΔT is 10 °C, for 10 gpm --> 50 gpm (R. Wands study). Conclusion is that flow restrictors would be nice, but are not necessary.
- *loss of all cooling to a module*: studied and conclusion is that module can survive, if necessary (with power levels consistent with target in place); for beam missing target RTDs will sense abnormal ΔT fast enough.
- *remote valves*: valves eliminated from system--turning off faulty circuit will be done by modifications at the manifold (next to RAW skid in bypass tunnel)

Core Design & Repair/Replacement

- *Module replacement:* dropped plan for module replacement; have redundant water circuits; module without cooling can reject heat adequately to adjacent modules
- *Decommissioning:* Core sits on carrier plate mounted on rollers, no hazardous materials, disassembly involves no grinding or burning, why not leave in place?
- *Weld Joint:* joint design inherently strong, mockup test done (E.V. will describe); water manifold removed to location next to RAW skid in bypass tunnel; turning off circuits will be done by modifying manifold

Installation Plan

- *Equipment:* Plan on use of purchased Lazer forklift (battery operated) (rental terms not very favorable); Mini-Jack crane is in budget as purchased item (bridge does not modify jacks--so rental is an option, but availability when needed would be a concern)
- *Crack staggering:* now in E.V. 3 D model
- *fail-safe equipment:* refer to Lazer forklift manufacturer
- *trolley drive:* hydraulic chain drive should handle bridge tilt adequately
- *swinging of loads:* Mini-Jack crane operates slowly, won't generate much swing

Cost Estimates, Instrumentation and Beam Interlocks

- *integrated cost, schedule:*
  - was presented at the 9/11-13 DOE Review & is available, did include oversight costs
  - will be discussed in a separate talk

•*redundant thermocouples:* use redundant RTDs, wired but not instrumented

•*flow rate monitors:* not reliable, not needed

•*system level:* is there, refer to D. Pushka material on RAW system

Additional Comments

- *Future Upgrades to Intensity:* Needed even to get to assumed intensity of 4E13 per spill every 1.9 seconds (Minos would like to have this as a problem)
- *Personnel Egress:*
  - Not a WBS 1.1.4 design issue--except to keep clear passage and keep residual radiation levels reasonable. Labyrinth design is cognizant of this requirement.
  - There is impetus from the Minos collaboration to extend the decay pipe into the target chase (24" diameter extension) and use a thin window upstream—to improve neutrino flux at the far detector. Utilizing helium instead of vacuum is a possibility in this scenario; will need to study ODH issues that would result.