Collider-Accelerator Department

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Memo

date: *April 6, 2009*

to: *RSC*

from: *D. Beavis*

subject: *Access to the PHENIX Service Building Roof*

There has been a request to access the service building roof at 8 O'clock to service an air conditioner unit. The ladders to this roof are locked during operations. Access to the service building roof also enables access to the counting house roof. The prints[1] for the shielding and the RHIC project reports[2] were reviewed in order to estimate the potential dose on the service building roof. Typically all the roofs for an IR have a common access and are locked together.

The smallest transverse distance from the service building roof to the beam axis is 55 feet. The north shield wall has two layers of shielding overlapping with the tunnel roof. The vertical overlap is 3.5 feet. There is a small vertical crack between the inner layer of shielding and the roof of the tunnel. There is no access to this crack for personnel on the service building roof. There is a vertical port for piping near the IR retaining wall far away from the service building. There are trajectories from the beam sources that go over the top of the outer layer. The minimum shielding distance for any ray near the top of the wall is 5.5 feet, which is confined to the inner layer of shielding. The inner layer is a composite block containing 17 inches of steel and 43 inches of concrete (width of block).

A shielding formula from reference 2 can be used to estimate the dose above the service building roof closest to the beam. The estimated dose for a maximum credible fault at the ASE beam limit is 130 mrem. There are several factors that should make this a conservative estimate. First the angle in the vertical plan would place these trajectories about 15 feet over a workers head. Lower trajectories quickly get more shielding and thus reduced potential dose. The formula itself uses an optimal source for the radiation and most likely overestimates the potential radiation. To the best of my knowledge the collider has never lost the entire beam in a DX magnet or in the triplets. Finally, for present access the collider is operating at about 60% of the ASE intensity, which has been used for the maximum credible fault.

A fault in the DX magnet on the opposite side of the IR was considered in reference 2. An estimated dose of 110 mrem was obtained at the outside of the north shield wall near the IR. Scaling this number for the increased distance would reduce the dose to 30 mrem or less. In addition it does not appear that the benefit of the experimental steel was taken into account.

Drawings of the berm directly opposite the service building were not examined. The transverse distance is 55 feet. The tunnel is 15 from the beam axis to the wall. A crude guess of 15 feet of soil would be reasonable. An estimated dose through the soil would be 7 mrem.

For comparison we note that the estimated dose outside the PHENIX for similar type faults is 250 mrem.

If a barrier with a locked gate was placed between the counting house roof and the service building roof then the service building access ladders could remain unlocked.

References

1. RHIC print numbers 908-01-02-C01, 908-01-02-C02, 908-01-02-C03, 908-01-02-C04,908-06-01-001, and two PHENIX IR prints.
2. A.J. Stevens memorandum, "Evaluation of the Current Counting House Shielding Design at 8 O'clock", 09/17/96; A.J. Stevens memorandum, "Evaluation of Counting House Shielding Design at 8 O'clock", 11/14/95; D. Beavis memorandum," Labyrinth Calculations in RHIC SAD", Dec. 16, 2008.

CC:

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