C-AD

Radiation

Safety

Committee

Issued: Sept. 20, 2012

Updated Minutes of Radiation Safety Committee of

May 9, 2012

Updated on Sept. 20, 2012: The database items from the minutes were not entered into the database until Sept. 20, 2012. Other items had been entered so the items in these minutes have had their numbers changed and are now entered into the database. This was reported to C-AD management yesterday for determination if reportable etc.

Subject: Review STAR Shield wall, RHIC Berm, Landau Cavities, and CeCpop at IR2

Present: D. Beavis, R. Karol, E.T. Lessard, A. Etkin, C. Theisen, C. Montag, J. Reich, W. Fischer, P. Sullivan, M. Minty, H. Kahnhauser

The committee met to review issues for RHIC. Two are related to evaluations for the increased beam intensity and energy and others were updates on interlocks for devices.

STAR Shield Wall

A memorandum[1] discussing the issues related to the STAR IR to Assembly Area shield wall had been distributed to the committee. A PowerPoint[2] presentation briefly outlined the discussion of the calculations and the expected dose in the event of a Maximum Credible Incident (MCI) for a beam fault. **The maximum dose outside the shield wall for half the beam in one ring interacting on the end of DX is expected[3] to be 110 mrem.**

A comparison between the initial 8.6 GeV Au fault study and the new calculation was presented. The new estimate "predicted" 1. micro-rad/(10^8 gold) and the fault study measured 0.45 micro-rad/(10^8 gold). This is much closer than the original CASIM calculation and within expectation of the uncertainties of the fault study and calculation.

The committee found the results to be both systematic and credible. **The committee concludes that the existing shield wall should be sufficient for an MCI with the beam upgrades.**

The note on the STAR shield wall (reference 1) will be updated to include the comparison of the fault study and also calculations that show the wall is sufficient with

the STAR detector removed. Knowing the MCI dose with the detector removed may be necessary for some the of eRHIC planning.

It was noted that the end wall and labyrinth need to be checked. Initial calculations indicate that the end wall will also be acceptable with the present fence location. However, the dose outside appears to increase if the detector is removed. This calculation will be documented in the near future.

Complete IR6 calculations and documentation for upgrade. **(CK-fy13-RHIC-813)**

RHIC Berm

A PowerPoint presentation[4] summarized the results that have been obtained for an MCI under a typical section of the RHIC berm. The RHIC Magnets were approximated in a similar fashion as the RHIC Project. The berm was calculated as 13 feet thick of soil with a density of 1.8 g/cc. A dose of 59 mrem was estimated[5] at a height of three feet above the soil. It was pointed out that 3 feet is often used as the distance that the primary blood producing organs are above the ground for an adult standing.

The estimate for the berm was compared to the fault studt that was conducted with 8.6 GeV gold beam. The scaled calculation is 0.53 mirco-rads/(10^8 gold ions) and the fault study measured 0.45 micro-rads/(10^8 gold ions). This is in good agreement and much closer than one should expect. The original calculation gave a much higher dose.

Complete documentation of berm dose from an MCI for upgraded beam intensity. **(CK-fy13-RHIC-814)**

Other RHIC Beam Upgrade Discussions

The issue of the vents around RHIC was discussed. Initial examination of calculations suggests that there were also some conservative choices made. The fault study for 8.6 GeV gold suggests that the results will be less than 200 mrem for an MCI. New calculations for the vents will start soon. **The committee recommends that the vents not be fenced pending completion of the calculations.** Should these initial estimates be incorrect and indicate fencing is necessary there is little risk for exposure from an MCI at a vent caused by a delay in installing the fencing.

Complete new calculations and documentation for dose from an MCI for upgraded beam intensity near a vent. **(CK-fy13-RHIC-815)**

The calculations of the PHENIX shield walls should be conducted. It is expected that similar results to the STAR shield wall be found and that improvements will not be necessary.

Complete new calculations and documentation for dose from an MCI for upgraded beam intensity near PHENIX. **(CK-fy13-RHIC-816)**

The results for the muons penetrating the berm from 300 GeV protons striking the collimator and beam dump should be documented and completed by the end of this upcoming shutdown.

Complete new calculations and documentation for dose from 300 GeV protons striking the collimators and beam dumps. **(CK-fy13-RHIC-817)**

CeCpop at IR2

Coherent Electron Cooling proof of principle (CeCpop) is planning to begin installation at IR2. The radiation sources that will be added to the IR include a superconducting electron gun, superconducting electron linac, warm RF cavities, and the associated electron beams to a maximum beam energy of 22 MeV. The project would like to have the interlocks as simple as possible. The cryogenic fluid will come from RHIC so that the gun and linac will only operate when RHIC is cold. CeCpop is willing to terminate operations should the arcs on either side or IR2 or IR2 need to be entered. Both the RHIC and CeCpop personnel seem happy with this mode. The committee has no objections. Therefore, the plan is that they will be allowed to operate if the adjacent arcs and the IR are secured. This is essentially the same as at IR4. The Access Controls Group will begin initial planning for the PLC changes. Details of the device interlocks will be determined as the devices are properly defined.

The gates between sectors do not lock at present. These gate may need to have electric strikes added to prevent access if the CeCpop is operations. This would again be similar to IR4 for operating the RF.

Review all potential radiation issues for CeCpop at IR2. **(CK-FY13-RHIC-818)**

Landau Cavities

The Landau cavities will have their interlocks upgraded to dual interlocks during the shutdown. Scaling the x-rays from the high-voltage and high power cavities suggest that these cavities would not produce more than 50 rads per hours. However, if one uses the 150kV potential and the maximum of the power supply of 3kW then it may be possible that the cavity could generate more than 1000 rads of x-rays. This is unlikely but no process to prevent such a large current has be presented. It was decided that we should provide dual protection. One protection device will be in division A and the other protection device in division B. There would be no cross-talk of the protection devices and no reachback. **(CK-FY13-RHIC-819)**

References

1) D. Beavis memorandum, “Shielding Wall requirements at STAR”, April 20, 2012; http://www.c-ad.bnl.gov/esfd/RSC/Memos/STAR_wall.pdf
2) D. Beavis PowerPoint presentation, STAR Shield Wall”, May 9, 2012; see link****
3) This is for a proton beam of 300 GeV with an intensity of $5*10^{13}$ protons per ring. It includes a factor of 1.3 to account for the difference between MCNPX and MARS. It also has a factor of 1.3 to account for the maximum dose asymmetry from a dipole.
4) D. Beavis PowerPoint presentation, “RHIC Berm”, May 9, 2012; see link***
5) The 59 mrem has the factor of 1.3 from the ration of MARS to MCNPX that was determined outside of 5 feet of light concrete in a study by K. Yip. It is used to be conservative, although it is not clear which number is more accurate.

CC:

Present
RSC
RSC Minutes e-File
A. Pendzick
A. Dress
W. Meng
W. Christie
J. Dunlop