

**C-AD**

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**Radiation**

**Safety**

Minutes of RSC Subcommittee of January 20, 2010

**Committee**

**Subject: Low Energy Operations and Upgrades for RHIC**

**Present:** D. Beavis, R. Karol, E.T. Lessard, T. Satogata, A. Etkin, P.K. Job, C. Theisen, and J.W. Glenn

The committee continued its review of the materials provided for low energy operations and upgrades of RHIC.

**The committee recommends that the Department proceed with its plans to provide low energy beams for RHIC this year.** No issue has been identified that would prevent operations with low energy ion beams.

The issue of soil activation was not discussed. The committee has the RHIC analysis<sup>1</sup> concerning the potential for soil activation from low energy beams. The committee has already recommended<sup>2</sup> that the Department pursue having the BNL standard for known beam losses modified. The recommendations for monitoring the potential for soil activation are given in reference 1. The removable soil samples have already been distributed and the list for AtR and RHIC are given in reference 3.

The committee discussed the documents, reference 4, 5, and 6, that estimated the potential dose at various locations at RHIC. Some of these documents have started to introduce the potential exposure issues related to RHIC upgrades in intensity and energy besides providing estimates for low energy operations. The upgrade estimates have estimated exposure levels for a Maximum Credible Incident (MCI) that are higher than the committee would recommend for approval if they are accurate or credible. The committee recommends that the Department should assign resources to determine whether the listed maximum credible incidents are possible. This would allow a better utilization of resources to resolve the issues that will need to be addressed. Many committee members feel that the footprint of a beam loss in a short distance is not credible for most sections of the RHIC ring. **(CK-FY2011-RHIC-681)**

Beam operations scenarios and beam losses should be rewritten based on the ten years of operational experience and then used to access yearly exposure levels. The C-AD SAD will be

updated by the end of the year and these updated scenarios based on operating experience would be very helpful. **(CK-FY2011-RHIC-682)**

The document on exposure near ventilation ducts did not enter specific recommendations into the RSC check-off database. The committee recommended that:

Prioritize by risk those ventilation shafts that should be examined for potential dose. There was not a cross-reference between ventilation shaft type and which ducts are accessible. **(CK-fy2010-RHIC-683)**

TLDs should be placed by several of the shafts to register the exiting dose. This should be considered for both “normal” operations and for low energy operations. **(CK-fy2010-RHIC-684)**

The other recommendations given in reference 4 should be considered on a longer time frame but if practicable be implemented sooner. **(CK-fy2011-RHIC-685)**

Reference 5 discusses the potential exposure that can occur from radiation penetrating the earthen shield. The only section of the berm that is an uncontrolled area is where Renaissance Road crosses the RHIC berm. An MCI with 250 GeV protons could create 56 mrem at the road. This would exceed the committees 20 mrem exposure to people in an uncontrolled area from a beam fault. However, most of the committee does not believe<sup>7</sup> that such a fault is credible. For low energy operations an MCI is not an issue for exposure limits. Chronic exposure, if any, can be maintained within limits by RCT surveys and loss monitoring.

Exposure should be less than 100 mrem in the Controlled Area around RHIC. The RHIC Project had used a judgment that MCIs were not covered by the exposure limits of 10CFR835. However, usually the committee tries to stay below 100 so that there is not a potential reportable occurrence. Radiation workers wearing TLDs should not receive an exposure above 500 mrem. As new operations are developed this discontinuity between RHIC Project goals and C-AD RSC exposure rules will need to be rectified. Again creating more realistic beam use and loss scenarios may help focus resources where the exposure potential is a “real” concern.

Ten recommendations were given in reference 5 and entered into the check-off database. The appropriate ones should be closed before low energy operations this year.

The committee did not directly discuss the labyrinths since they have the lowest estimated exposure potentials presented. Most are monitored by chipmunks and TLDs. On duty RCTs conduct surveys at the labyrinths that exit near occupied areas such as the experimental IRs. No specific recommendations were given in reference 6.

The calculations have used a doubling of the neutron dose potential. The updated 10CFR835 weighting factor of neutrons may be more like a factor of 1.3 instead of 2. This should be examined in the future. At present the factor of 2 is conservative. This impacts all C-AD areas but will be listed in the database under RHIC. **(CK-FY2010-RHIC-686)**

The access requirements should be reviewed for entry with and without a survey into the RHIC ring and IR locations until residual activation is estimated or determined by RCT surveys. (CK-FY2010-RHIC-687)

## References

- 1) D. Beavis memorandum, "[Low Energy RHIC Operations—Potential Soil Activation](#)", Nov. 24, 2009.
- 2) RSC Minutes of Sept. 30, 2009, "[Low Energy Operations of AtR and RHIC](#)".
- 3) List of [AtR and RHIC](#) removable soil samples provided by M. Van Essendelft. The locations were chose by R. Karol, M. Van Essendelft, and D. Beavis.
- 4) D. Beavis memorandum, "[Potential Dose Near RHIC Emergency Ventilation Ducts](#)", Dec. 18, 2009.
- 5) D. Beavis memorandum, "[Potential Dose on the RHIC Berm](#)", December 30, 2009.
- 6) D. Beavis memorandum, "[RHIC Labyrinths](#)", Jan 14, 2010.
- 7) See item 681 discussed above.
- 8) "[AtR Low Energy Operations—Potential Dose](#)", Sept. 23, 2009.
- 9) RSC Minutes of Feb. 3, 2009, "[Proposed Modification to Thompson Road](#)".
- 10) D. Beavis, "[Low Energy RHIC Operations: External Dose from the Beam Dumps](#)", memorandum update Nov. 20, 2009 (Sept. 3, 2009).
- 11) D. Beavis, "[Low Energy RHIC Operations: External Dose from the Beam Dumps](#)", memorandum update Nov. 20, 2009 (Sept. 3, 2009).

CC: Present  
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