C-AD

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Radiation

Safety Minutes of Radiation Safety Committee of October 17, 2007

Committee

Subject: RFid Tags and New Key Tree at RHIC and New Deuteron TtB Operating Parameters

Present: D. Beavis, A. Etkin, R. Karol, E.T. Lessard, J.W. Glenn, L. Ahrens, C. Carlson, J. Reich, C. Gardner, D. Green, W. MacKay, and K. Yip

RFid Tags and New Key Tree at RHIC

The committee discussed the use of RFid tags at RHIC for the STAR areas and a new associated key tree and iris reader.

Motivation

It was requested that controlled access using remotely released keys at STAR be added to the two arcs (5 and 6) so that the PP2PP experimental apparatus could be accessed in a timely fashion during the run. In addition, some components of the iris scan system are becoming obsolete. It was decided that using a newer iris scanner coupled with a new key tree and RFid tags would be a good choice. This system is similar to what is envisioned for the future at NSRL.

The committee recommended that the RFid tags, new IRIS scanner, and new KEY tree be approved for use at STAR and the associated arcs.

Discussion

J. Sandberg provided a written review[1] of the system including a description from J. Reich. The system is used in security applications. Although reliability and failure modes are not know it is anticipated the installed system will meet accelerator requirements. The access controls group will provide future information on any issues that arise with the new system.

The Rfid tag is attached to a key that is released from the key tree. A security ring attaches the tag to the ring and it requires a special tool to open. It would require substantial cutting tools to remove the tag from the key without the correct tool.

The RFid tag must be within about 1.5 inches of the reader for it to activate the relay in the gate logic. A simultaneous release is required from an operator viewing the gate and person from MCR.

The Iris scanner will accept the files that exist from the present iris scanner so that users do not need to go through a new registration process. The new iris scanner and key tree will not allow a key to be return and captured unless the person scans their iris to return the key.

The key switch does not detect the key in a redundant fashion as done in the present key trees. Redundancy of the key tree is not part of the interlock requirements. The committee would prefer to stay with a redundant system if practical. The access control group will examine if future key trees can be provided with the desired redundancy and if the present one at STAR can be retrofitted later. **(CK-RHIC-fy2009-523)** The key position drives two relays one for division A and one for division B.

Operations needs to examine the controlled access procedure to determine if it requires being updated. In addition the operators need to be informed on how to handle the accesses with the new RFid tags. **(CK-RHIC-fy2008-524)**

Feedback should be given to the committee as experience with the system is obtained.

Deuteron Operating Parameters for TtB

Motivation

Two changes in the operating parameters for the transport of light ions from the tandem to the booster have been requested. It is desired to use one harp wire plane instead of two for monitoring the beam intensity of deuterons so that the 15% loss can be reduced in half. It is desired to use a different charge state of Au than the last deuteron run and if the energy can be increased to 18.5 MeV for the deuterons then the Au and D beams will have the same rigidity.

The committee recommends that the upper limit on the dipoles established by RIS units be increased to 20 MeV for light ions.

The committee recommends that the light ions can be operated with one wire plane as a scattering source for the intensity monitor.

Discussion

Two planes of wires are presently used to monitor the beam intensity of light ions into the TtB tunnel. The wires scatter the beam and the scattered radiation is monitored by two chipmunks. The interlock level is established to correspond to a deuteron current of 200 nano-Amps and the alarm level is set to correspond to 120 nano-amps. The location of

this harp is such that both beams are nearly a maximum in size for the tunes that are useful for transporting beam into TtB. The beam may be able to be tuned onto a few wires, although it would not be transported to the booster. The removal of one plane did not appear to increase the risk for the intensity monitor system to fail.

The past experience is that the harp at this location has never broken a wire. Instead a channel of electronics associated with a wire can fail and the signal of that wire displayed in the tandem control is lost. The scattered radiation is not lost. If a wire breaks both the signal is lost and the scattered radiation. Typically 10-15% of the beam can be on one wire channel, representing a change of this size to the radiation level monitored by the chipmunks. The committee did not consider a change in the effective threshold of 10-15% to be an issue. Loss of multiple wires could represent an issue for monitoring the beam intensity.

The procedures for monitoring the beam intensity/harp will need to be modified. Should one signal channel be lost the procedure must have personnel check the electronics and repair at the first available opening. If one wire is broken the liaison physicist should be notified and the harp should be fixed by the next scheduled maintenance day. Should two wires break then the procedure must instruct the operators to fix the harp. The present harp can be replaced with an appropriate substitute. **(CK-Tandem-fy2008-d-525)**. Having a two-plane harp for tuning and a single plane harp for intensity monitoring next to each other is under consideration. Should the single plane harp fail the access control group could wire the two-plane harp into the interlocks.

The discussion on the potential dose rates followed the material[2] provided by D. Beavis. C. Gardner noted that the deuterons in a year used in the note by D. Beavis was not correct. The note was updated to correct that error and several other updates were added after the meeting. The dose on the berm is based on the **transport of $1.2*10^{18}$ deuterons at 20 MeV** for the upcoming program. There is an allowance (20%) for other light ion needs beyond the RHIC program, such as NSRL.

The routine chronic dose rate outside a hypothetical loss point (2%) with thin shielding (3 ft) is estimated to be **2.6 mrem in a year at waist height on the berm**. The committee discussed whether such a thin spot exists on the berm. After the meeting the berm surveys taken in 2001 were located. The thinnest berm west of Rutherford Drive is 3.39 feet. Based on the dose verses soil depth calculations of K. Yip there would be an additional reduction of more than a factor of 2 for the 0.4 feet of additional soil. The thinnest spot appears to be at Rutherford Drive where dose measurements have been made with17.5 MeV deuterons. If the hypothetical routine loss of 2% occurs at this location the dose would be 0.8 mrem in a year using an occupancy factor of 0.015. This location is monitored with a TLD. East of Rutherford Drive the berm was upgraded in 2001. Post upgrade surveys have not been found but the drawings for the upgrade show a required 3.5 feet minimum thickness for the areas upgraded. Thus, it is believed there is no location with less than 3.5 feet of soil coverage east of Rutherford Drive.

The maximum expected dose rate in an hour occurs during the tuning operations of the machines. During these operations the **maximum at waist height is expected to be 0.14 mrem in an hour.** The initial TtB tuning has a restriction of 25 nano-amps of DC equivalent deuterons. This restriction limits the dose rate in the tunnel near the beam stops to well less than 50 rem in an hour.

The committee was comfortable that the doses from TtB operations would be well below the ASE, but requested the following:

> Consider where it is appropriate to get new land surveys after the RHIC programs turns on to identify any potential thin areas. **(CK-Tandem-fy2008-526)**
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> Radiation surveys should be conducted during operations. Any thin locations identified in the elevation survey should be checked for radiation. **(CK-Tandem-fy2008-527)**
>
> Examine if the present TLD monitor program is sufficient or requires additional TLDs. **(CK-Tandem-Fy2008-528)**

References

1) J. Sandberg, memorandum to D. Beavis, "Modifications to the Iris Recognition System at 6 O'clock", Oct. 12, 2007.
2) D. Beavis, "Requested Change in Deuteron Parameters for the TtB Line", updated Oct. 19, 2007.
   References (from 2 above):
   1) A. J. Stevens, "TTB Operating scenario for Deuterons Delivered to RHIC", Sept. 14, 2001.
   2) C.J. Gardner, "Estimate of Number of Deuterons Delivered and Lost in the TtB Line", Sept. 30, 2007.
   3) K. Yip, e-mail to D. Beavis, August 31, 2007.
   4) NCRP Report no. 151, Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-ray Radiotherapy Facilities, Dec. 31, 2005.
   5) F. Zafonte, radiation survey, Nov. 25, 2002
   6) E.T. Lessard. E-mail to R. Karol and CCed to D. Beavis, August 2, 2007
   7) Radiation Hazards from Low Mass Ions in the Tandem to Booster (TtB) Line, Unreviewed Safety Issue, Nov. 15, 2001.
   8) F. Zafonte, Radiation Survey, Nov. 25, 2002.

cc: RSC minutes file
RSC RHIC file
RSC Tandem file
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Attendees