Tuesday 21 June 1994
K. Reece

Minutes of meeting: Radiation Safety Committee, Monday 20 June 1994

Present: D.Beavis, A.Etkin, R.Frankel, W.Glenn, R.Heyder, E.Lessard, W.MacKay, A.McGeary, S.Musolino, K.Reece, P.Sparrow, J.Spinner, K.Woodle.

Subject(s): 1. RHIC access Control System - R.Frankel.
2. g-2 Status - E.Lessard.

First on the agenda was a presentation by R.Frankel concerning the proposal for the Access Control System for RHIC (and the g-2 areas). Details of this proposal are available in the attachment; however, and overview follows.

The system is composed of two parallel and redundant systems (division "A" and "B") that are PLC based. Each "half" of this system uses separate processors to help eliminate "common cause" failures. One side uses Motorola processors and the other Intel, with different compilers. The technique used to differentiate between types of interlocks (gate #1 open, gate #2 open, etc.) is to monitor the voltage drop across a reference resistor. The difference in this voltage drop is large enough to be unique for any given interlock mode and well above variations due to temperature or noise.

The manufacturer estimates the "mean time to failure" of these components to be 300,000 hours, but this may not necessarily lead to a "fail-safe" condition. Also, this estimate is for individual components, not several in series. However, these PLC's have a self-test operation built in that cycles frequently and reports to the "supervisor" processor who then flags the failure (an interlock may then be initiated but the exact response has not yet been decided). It has been suggested (by A.Etkin, chair of RSC sub-committee reviewing this proposal) that this self-test operation be a difference voltage that is detectable by the PLC but smaller than any minimum voltage used by the system to identify a unique interlock. Further work on this self-test process will continue.

The individual PLC scan time will be between 2 - 25ms depending upon the code that is developed for the unit. The autonomy of these two parallel systems will be extended to the code written for each. R.Frankel will write to code for the "A" division and R.Heyder (engineer in the Security group) will write it fore the "B" division. There was some discussion concerning what the basis for writing the code for each side should be. It was the opinion of the committee that the outline to write the "B" division code should be only the logic diagram of that one side of the parallel system, not a detailed breakdown of the steps involved. Code for the Control Room response will be written by A.McGeary.

Crash actuators for the tunnel will be a continuous run with no more than 6' to a cord. In the g-2 area, some crash actuators will be discreet buttons. When a crash is activated, a "flag" pops up at the actuator and an audible alarm is initiated. The proposed locations for these actuators in the RHIC transfer line (not the g-2 area) have been preliminarily reviewed by W.Glenn and R.Zaharatos and will be submitted to the RSC for approval.

Chipmunks for the RHIC transfer line and g-2 area will be "home-run" (dedicated individual wiring to central location) because these locations will probably change over time.

The method used to sweep and secure an area will be similar to a "night watchman". The sweep team can define the sequence of individual resets during the sweep and then reset each station in that sequence. If the sequence was complete and correct, the "watchman" equipment then will generate a unique code that must be input to the Security system in order for the sweep to be valid.

RSC concerns:

1. Any committee questions, concerns, etc. should be directed to Asher's sub-committee to be considered and brought to the full RSC at a later date.
2. Can/should the individual PLC security information be viewed/compared by the "supervisor" processors and the higher level ?
3. The hardware and software configuration control for this system should be maintained by RHIC.
4. The output from each decision should be generically defined, (eg: beam switch #1, inhibit AGS beam, etc.).
5. The "template" from which the division "B" code is written should be simply the logic diagram of the system.
6. One committee member suggested the option of implementing both the "old" (present AGS interlock system) and the "new" (RHIC PLC based system) in the g-2 area.

RSC Action Items:

1. A logic diagram of the proposed security/interlock system should be developed and submitted to the RSC. In instances where a specific device may not yet be defined, generics may be substituted - (R.Frankel).
2. System test procedures must be developed and submitted to the RSC - (R.Frankel).
3. Consideration should be given to a small "system test" in a noisy environment, (eg: F-10 House) - (R.Frankel, A.McGeary).
4. Possible failure modes of individual elements of the system as well as the system as a whole should be considered. Additionally, the type of failures should be estimated (fail-safe of not fail-safe) - (R.Frankel, A.Etkin sub-committee).
5. (RSC chair comment) Establish milestones for individual element and integrated system tests for both RHIC transfer line and g-2. Include dates for PASS/FAIL determination for each area application - (R.Frankel, A.Etkin sub-committee).

The second presentation concerned shielding and penetrations related to g-2 operation (E.Lessard). A source document was distributed to the RSC for reference (g-2 TN#192). Certain points noted in the reference text are;

1. The Radiation Area fence will be extended from the Booster, around Bldg.919 to the North Conjunction Area.
2. Above the berm, in the upstream U-line is an area that will be Class IV but in a fault could rise to Class II and will be controlled accordingly.

3. The trenches near the g-2 target (by the old 8 degree igloo) will have 9' of concrete added to both left and right sides.
4. A shielding block will be buried (at 0 degrees) downstream of the first bend in the secondary beam line.

Specific concerns expressed by the committee are as follows;
1. As noted above in item#2, this loss at Q8 and Q11 may be controlled by monitoring and interlocking on the current setpoints of upstream dipoles.
2. The "old 8 degree igloo" will be a class III area and will be controlled accordingly, (door interlocked and chipmunk).
3. What use is the upstream (beam left) adjacent tunnel from the AGS ring ? Can/should this be plugged ?4. If the g-2 control room has a chipmunk, why shouldn't there be one outside of Bldg.919 ?
4. Previous assumption of the g-2 intensity was an average of 1/4 the maximum AGS beam.
5. The calculations done for the cooling water estimates were questioned by one committee member. These should be reviewed by D.Beavis and E.Lessard.
6. This review (Lessard) was done for 3×10^{13} per second which is consistent with an AGS intensity of twice this and a repetition rate of 2 seconds.

Action Items:
1. Penetrations (several 6" at floor level and one 10" x 30" used for the dehumidifier) from the tunnel to the "old 8 degree igloo" must be reviewed for improved shielding and submitted to the committee - D.Phillips, E.Lessard.
2. Controlling access to the "V" target area should be reviewed due to the high residual activity - E.Lessard, E.Njoku.
3. Immediately downstream of FEB gate #1 there is transformer yard that has buoy anchors along the inside wall parallel to the U-line. This need for this shielding must be reviewed and documented - D.Phillips, E.Lessard.