

Date: November 19, 1993

Minutes of the AGS Radiation Safety Committee

JWA

Subject: B2 Test Beam and Specification for Failsafe Review of Two Electronic Systems.

Meeting Date: December 21, 1992

Present: D Beavis, H Brown, A Etkin, C Flood, JW Glenn, E Lessard, A McGeary, S Musolino, K Reece, J Spinner, A Stevens, P Yamin, D Dayton, P Pile, J Ryan, & R Youngblood.

Summary

With modifications to the upstream caves, B2 Test Beam is approved as proposed. Particular care will be required in training the users in sweeping the area. There was a lively discussion on techniques for reviewing "Fail Safe Active" systems.

Meeting Minutes

B2 TEST BEAM.

A Carroll presented the operating parameters and access control proposal (Attachment #1).

The Beam Switch is to be B2D1. A Fault Study will be needed to confirm that with this magnet off, levels in the Test Beam area do not exceed 100 mRem/hr (B2CK#1).

The secondary beam normal operation will be Class IV (less than 2×10^5 particles/cm²/sec or $< 7 \times 10^5$ /pulse) assuming a 25% interaction target and 30% of the beam focused on the target (Attachment #4). The expected "flat-out" positive beam at ~3 GeV/c is 2×10^7 per 10^{13} fully focused on the target, or 100 times the Class IV limit for 3×10^{13} per pulse on a 3 sec. rep-rate. Thus 2 NMC's will be required to limit the beam intensity to $\leq 7 \times 10^5$ per pulse for Class IV area compliance (B2CK#2).

The Committee understands the strong operational need that the area be swept by the users but was uncomfortable with the request. There is almost 100' of open beam in a 2500 sq ft area, which is proposed to be swept by non-BNL personnel. It was agreed that with careful training of a limited number of users and careful accountability of the control of the area, user control would be tried.

A calculation of levels at the fence with 10^6 (5 times normal or 1/20'th full beam) hitting a "100%" target indicates that levels at the fence will be about 1 mRem/hr. The users would typically monitor their detectors while stationed near the west fence of the area. The annual dose must be less than 500 mrem, a Chipmunk in the area will be required to reach this goal (CK).

We are concerned that the beam could miss the beam stop. This will be checked by calculation (Attachment #2) and Fault Study (B2CK#3).

The Committee was concerned about making the B2 upstream cave and the B5 telescope caves Class IV. Not well known was: the leakage through the B5 telescope ports; what levels the B2 upstream cave would rise to if the full beam died near the B cave wall; and what how much dose the skyshine from these caves would cause the users next to the fence. It was decided at the meeting to combine the two caves. [Subsequently it was decided to roof the combined cave and make it a primary beam area.] Another concern is the western end of the trench under B2D2; D Dayton agrees to fill this trench.

FAIL SAFE ACTIVE INTERLOCKS.

The Committee agrees that a quantitative method of determining what is "good enough" in design and review of "Fail Safe Active" Systems is needed. Glenn and Musolino had previously distributed memos on this subject (Attachments #5 & #6).

There was much discussion on what is the "system" that will be reviewed. We agreed that these are "sensors" & "Will not reduce system reliability compared to one that has a micro switch."

Next discussion centered on what is a "review". Detailed comments included: "Redundance" does not give a "squared" reduction in failure rate, one tenth is more typical; for a " 10^{-3} " system, the failure rate for a detector must be much lower; the "challenge" rate to and testing of a system is vital to determining its failure rate; and the most important part of the review is to critically check the failsafe features. R Frankel, A Soukas, & D Beavis will try to come up with guides for "Good design for Fail-Safe design & implementation."

Check List Items:

- B2CK#1 - Beam switch fault study reviewed.
- B2CK#2 - Require two NMC's in beam to limit intensity to $<2 \times 10^5$,
- B2CK#3 - Beam stop fault study reviewed.

Attachments (file only):

- #1 - "Access to B2 Beam Line Area", A Carroll, Dec. 12, '93 *92*
- #2 - "Requirements for B2 Beam Stop"
- #3 - B2 shielding, BNLDAG::CARROLL, to DAYTON, Nov 4, '93 *92*
- #4 - B2 target size, BNLDAG::CARROLL, to DAYTON, etal.,
Nov 9, '93 *92*
- #5 - "Design Review of --", Glenn to RSC, etal., Dec 9, '93 *92*
- #6 - " , Musolino to Glenn, Dec 15, '93 *92*

Distribution: Radiation Safety Committee and guests
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