

10/30/96 See e-mail response
attached (Stevens →
Reece)

Wednesday 23 October 1996

K. Reece

Minutes of Meeting: Radiation Safety Committee

Date: Thursday 12 September 1996

10/31 See response (memo) from
S. Musolino attached. *AKR.*

Present: L. Ahrens, D. Beavis, H. Brown, J. Durnan, A. Etkin, H. Kahnhauser, E. Lessard,
W. MacKay, R. Miltenberger, S. Musolino, K. Reece, C. Schaefer, A. Stevens,
R. Thern.

Subject: RHIC design criteria for prompt radiation.

[Background]

This topic was presented to the RSC several years ago but there was no clear resolution/recommendation from that meeting. Many (~ 3 - 4) years ago, RHIC developed a design criteria for prompt radiation around the RHIC facility. This criteria pre-dates the new Federal Regulation (10CFR835) which is now "law" and states that a facility cannot exceed a dose of 100 mrem per year to minors and members of the general public (i.e. "untrained personnel"). This RHIC design criteria of 160 mrem is for a fault at certain locations on and around the ring berm; but more generally, the ring berm fault level would be ~ 114 mrem.

It should be noted that this 160 mrem berm fault level incorporates x2 increase in the Quality Factor and results from CASIM calculation estimate of 50% of beam lost on a single element. Also, the majority of the RHIC berm (main area of concern) has very low occupancy. The occupancy question may not be relevant however, since the fault (and therefore the dose) occurs in one pulse (=> quenched magnets prevents second occurrence at the same location). The AGS (and other machines that can produce continuous radiation) does take occupancy into account in some cases. The design criteria for integrated dose for all readily accessible and/or occupied locations at the AGS is always specified to be << 100 mrem.

The RHIC berm is proposed to be an uncontrolled area; which is the reason this 160 mrem in a single pulse fault is a problem to be addressed. This level is greater than the "legal" limit specified in 10CFR835 (< 100 mrem/year) for uncontrolled areas for minors and members of the general public. The question of posting the RHIC berm and whether this "satisfies" the "control" requirements of 10CFR835 has been asked. Finally, the experience at FNAL with a superconducting accelerator suggests that the top energy/full intensity proton beam may be lost once per ~ 7 years and even then, the loss is distributed over several elements (~ 6+) around the accelerator.

Meeting Minutes:

This RHIC design criteria of 160 mrem in a low occupancy area was developed many years ago, published and has been assumed to be valid by RHIC for some time. As noted in the background information, this criteria used as one of the guidelines "DOE 5400.5" and an interpretation of paragraph 3. "DOSE LIMIT SELECTION" where it referred to a "higher annual limit of 500 mrem as suggested ICRP as an occasional annual limit ... if it is justified by unusual operating conditions". Again, this was developed before 10CFR835 became law. In an earlier RSC meeting (ref: 2 November 1992), the committee was not able to come to a consensus regarding acceptance by the RSC of this level being greater than 100 mrem in an uncontrolled area.

Discussion of the feasibility of posting and/or fencing the RHIC berm provided no result. Some felt that this would satisfy 10CFR835 in that RHIC would then demonstrate "control" over the area, and the possibility of violating the law would be minimized, (ref: 10CFR835 § 835.207, 835.208). Arguments against the proposal included the probability that "real control" of the area would require actual observation by an individual at some frequency to satisfy the requirements of controlling the area. [Other DOE facilities have been fined simply for not defining and provided adequate controls as defined in 10CFR835, not the actual violation of the DOE order by exceeding a limit]. Also, if a fault occurred at a location under the road while minors and/or members of the general public were passing by, this would still be a Reportable Occurrence. An option of forwarding this question of "posting the berm" to DOE for an interpretation was suggested. However, it was also felt that this would probably not yield either a timely resolution or a complete answer to the general question. Another opinion was expressed that 10CFR835 "does not address abnormal conditions" and therefore does not apply.

As a means of reaching some measure of agreement, the discussion turned away from the "design criteria level of 114 to 160 mrem in a fault" and rather toward a review of the loss basis assumptions. In this approach, the following comments were noted;

1. From FNAL Tevatron experience,
 - 1a. a top energy/full intensity beam abort once per ~ 7 years.
 - 1b. The beam is lost at several (~ 6+) locations around the ring.
2. RHIC worst case is for 4 x "design intensity" proton beam at full energy.
3. In the CASIM calculation, a factor of x2 greater Quality Factor is used. AGS experience suggests this to be unnecessary in general practice, (ref: J. Preisig QF measurements in the AGS SEB areas - RSC files).

4. Options for actual measurements include; (any one of these should document the "built-in conservative parameters" used in the original CASIM estimates).

4a. Placing TLD's in the RHIC ring at known loss points (=> injection location and energy).

4b. With circulating/accelerating beam available, verify the CASIM estimates at the RHIC internal beam dump. The shielding material here is different from the berm *but* it is the *same* method being used.

Recommendations:

1. The committee was unable to recommend acceptance of the RHIC design criteria. More explicitly, the general view was that the RSC had neither the authority nor responsibility to define and accept a design criteria (no matter that it is a very low probability occurrence) that exceeds 100 mrem in an uncontrolled area.

2. RHIC may want to revisit some of the loss basis assumptions used as input for the "design basis fault". Any "small" change in one of many of these parameters would lead to a ~ 50%+ reduction in the final estimate of the possible fault level.

3. Measurement is the "best" method. Proposals suggested in item#4 above (as well as others to be considered) should also provide a result that extrapolates to fault levels on the ring berm of < 100 mrem.

Attachments:

1. RSC meeting minutes of 2 November 1992.
2. DOE 5400.5 (part)
3. 10CFR835 (part)

cc: RSC (w/attachments)
RSC file (w/attachments)
D. Rorer (Chair - BNL Laboratory Safety Committee)

From: BNLDAG::STEVENS "Alan Stevens-BNL-(516)282-7432" 30-OCT-1996 15:50:
To: REECE
CC: STEVENS
Subj: 12 Sep minutes

Hi Ken,

I was disturbed by your minutes of the RSC meeting on the RHIC criteria. Your recommendation that the committee "was unable to recommend acceptance of the RHIC design criteria" implies that the committee rejected the criteria. Furthermore, I do not recall any discussion of the committee's "authority" or "responsibility".

My recollection of the meeting was that you stated that you could see both sides, but that there was no clear EXPERTISE within the committee to decide whether or not 10CFR835 applied. Other than that, and the fact that we spent a lot of time on Lessard's contention that posting solved the problem (which not only I reject, but so does EVERYONE I have talked to about this), there was little discussion - certainly nothing that reflected a "general view". So...

(a) is my recollection completely wrong???

(b) if I am mis-reading your intent (that the RSC - or you alone acting as the RSC chairman - defacto rejects the criteria), would you be willing to send out a supplement to the minutes which clarifies by stating that the RSC took no position -- either accepting or rejecting?

(c) if I am reading your intent correctly, would you be willing to state in writing to the Project Head what you find unacceptable about the criteria?

alan

cc: to RSC chair file

attach to RSC mtg minutes of 12 September 1996

BROOKHAVEN NATIONAL LABORATORY

RHIC Project

MEMORANDUM

DATE: October 31, 1996

TO: K. Reece

FROM: S. Musolino *SM*

SUBJECT: Comments on Radiation Safety Committee Minutes from September 12, 1996

The minutes of the subject meeting do not appear to be an accurate record of both the purpose and conclusions. The purpose of the meeting was to attempt to bring closure to the status of the RHIC Design Criteria for Low Occupancy Uncontrolled areas. This issue has been the topic of debate a number of times by the RSC and Laboratory ES&H Committee without a clear policy decision.

Recently, Ed Lessard had stated that the promulgation of 10 CFR 835 invalidated the possible use of greater than 100 mrem of dose, and implied that the law covered low probability faults. The Project believed otherwise, and the meeting was called to present both interpretations. Subsequently, both sides were discussed by Ed Lessard and the writer. Ed Lessard, in his presentation, stated that merely posting the RHIC berm would relieve the Project of the perceived regulatory noncompliance. Henry Kahnhauser from the S&EP Division disagreed with Ed Lessard and stated that phone conversations with DOE-EH personnel indicated that they did not support the notion that posting would facilitate compliance. The minutes failed to mention this important point.

The first Recommendation stated, "the general view was that the RSC had neither the authority nor the responsibility to define and accept a design criteria that exceeds 100 mrem in an uncontrolled area." It was not my recollection that there was much, if any, debate by the Committee over the question of lines of responsibility, nor was it a priori the question. The minutes also did not state that the writer was asked by the Chairman to formally request an interpretation by DOE as to whether 10 CFR 835 or DOE Order 5400.5 was the defining document. That request was subsequently submitted to the S&EP Division Head for an evaluation. It would not have been an appropriate protocol to approach DOE without input from the Laboratory experts. That request resulted in S&EP concurrence with the Project position that DOE Order 5400.5 was applicable, 10 CFR 835 did not address low probability faults, and 160 mrem from a Collider fault was not a violation of 10 CFR 835.

October 31, 1996

The last two recommendations suggested that the Project may change loss assumptions to less conservative values, and that fault study measurements could demonstrate that the 100 mrem level could be met in practice. The Project disagrees that the loss assumptions should be modified, as it will decrease the level of safety for the facility, since less shielding thickness would be installed if 100 vs. 160 mrem was chosen as a criterion. The minutes fail to reflect this circumstance. The Project believes that installing less shielding based on an arbitrarily lower design criterion will needlessly lower the overall level of safety and, in part, for this reason still intends to pursue the use of 160 mrem as the criterion.

cc: W. R. Casey
M. Harrison
H. Kahnhauser
S. Ozaki
A. Stevens
RSC File (M. Heimerle)