Sunday 20 October 1996
K. Reece/A. Stevens

Minutes of meeting: Radiation Safety Committee, sub-committee

Date: Tuesday 20 August 1996

Present: D. Beavis, W. Christie, D. Dayton, B. Miller, A. Pendzick, K. Reece, R. Thern.

Subject: Design of STAR shield wall, (A. Stevens).

A design of the STAR shield wall between the assembly area and the RHIC ring was presented by A. Stevens for review. This area shielding has been reviewed before by the RSC, but the design has been modified to be a single shield wall of 5.5 ft and a different configuration of the labyrinth. The attenuations for the single layer shield wall and the labyrinth are included in the attachments.

A part of the East labyrinth is formed by blocks extending 10 ft. Vertically which are not covered by a roof and can be removed when necessary to move larger items into the interaction region (IR). One recommendation of the sub-committee review was that an additional stack of blocks be added (longer direction extending into the IR), also 10ft. vertically, (which would form a partial 4th leg to the labyrinth and significantly decrease the solid angle to neutron sources that could "shine down" under the labyrinth roof. The STAR collaborators present at the meeting agreed to this recommendation.

The analysis of the "cracks" in the stacked shield wall indicated that, over most of the wall surface, a substantial margin of safety exists between the calculations and the allowable dose. However, there are two regions of potential concern. The first is associated with vertical cracks near the very limited region of the pole tips. Allowance for a "thick iron effect" implies that the potential dose through two specific cracks (each 5 ft. in length) would exceed the criteria at some crack width between 1/8" and 1/4". The STAR collaborators agreed to shield these specific cracks with an approximately 3" to 4" thick slab of hydrogenous plastic as suggested in A. Stevens analysis, (attachment #2). [Note: a 3" thick slab reduces the dose by a factor of about 2.5; at this reduction, the criteria is barely achieved for a 3/8" crack - which is the maximum allowable].

The second concern was a horizontal crack located 8" from the midplane. In the analysis,

a crack at this location would be acceptable for 1/8" width but NOT acceptable for 3/16" width. The STAR collaborators agreed to study several possible approaches to limit the crack width at this location and propose a solution to the RSC. The possibilities include;

1. Validate by measurement (and document) , some particular configuration of existing blocks does not have a crack > 1/8" at this location. Perform some testing to show that repeated stacking/un-stacking does not change the characteristics of the configuration (i.e. "crack" width). An acceptable method of "measuring" the crack width must also be defined.

2. "Seal" the midplane crack using some thin and compressible material between the blocks at this location. Again, a method to measure the effectiveness of this "seal" must be defined.

3. Eliminate this midplane crack concern entirely by using some different height blocks in one or more rows. [For reference, a horizontal crack 1.5ft off the midplane does not present a problem for prompt radiation - the attenuation is more than adequate].

4. "Block" the crack using some hanging material on the wall. [It was noted that this crack is a "high energy" problem which implies that 6" of steel would be required for an attenuation of a factor of two; this would then allow a 3/16" horizontal crack at this location].

Attachments:
1. Viewgraphs - A. Stevens
2. "Analysis of cracks in the STAR shield wall", A. Stevens, 08/12/96
3. RHIC Detector Note #21, "Approximation for low energy dose through cracks in shielding walls", A. Stevens, June 1996.

cc: RSC w/attachment #1
RSC file w/attachments