

Minutes of Radiation Safety Committee of January 21, 2003

**Polarized Protons in Booster with BAF**

Attending: C. Gardner, A. Etkin, K. Brown, L. Ahrens, A. Rusek, and D. Beavis

A sub-committee was asked to review what constraints are necessary with polarized protons in the Booster with BAF.

The Booster is expected to begin operations with polarized protons in preparation for the RHIC program. Initially the Booster will have 1 polarized proton bunch per 5.4-second cycle. Eventually it is expected that the Booster will have six bunches per 5.4 second cycle. The bunch intensity is not expected to exceed  $5 \times 10^{11}$  protons per bunch based on previous operating experience. The total amount of polarized protons is expected to be  $5.5 \times 10^{11}$  protons per second.

The Booster is presently operating with deuteron and gold beams. The deuteron intensity is  $5.5 \times 10^{10}$  deuterons per second or  $1.1 \times 10^{11}$  nucleons per second. This implies that the polarized protons have the potential to produce radiation levels approximately 10 times higher than the deuteron beam.

A fault study was conducted on the B6 septum magnet to examine the shielding between the Booster and the BAF stub tunnel.  $1.85 \times 10^{10}$  deuterons per second at 800 MeV struck the B6 septum magnet. No detectable dose was seen on the berm or in the BAF tunnel where personnel can be with the Booster operating. Personnel are not allowed in the stub tunnel with the Booster operating. A rem-ball was placed in the sub tunnel to measure the dose rate before the labyrinth, which exists in the stub tunnel. A dose rate of 0.06 mrem/hr was measured. This suggests that a fault of 1.6 GeV polarized protons on the septum would produce levels in the stub tunnel of 1.8 mrem/hr.

Fault estimates for the BAF berm have been done should the polarized protons be extracted into BAF. The berm is expected to have a dose rate of less than 0.04 mrem/hr (for  $5.5 \times 10^{11}$  protons per second at 1.6 GeV). The two entrance labyrinths will have substantially lower dose rates.

The sub-committee decided that based on the fault study and the shielding estimates that the constraints presently in place for ions are sufficient for polarized protons.

**BAF is still in a commissioning phase. Polarized protons can be used for commissioning, with the appropriate nucleon-GeV beam limits applied.**

A fault study will be conducted on the Booster B6 septum with polarized protons to allow for more accurate scaling for full intensity protons (**ck-baf-fy2003-321**). There are no plans to inject full intensity protons into the Booster this year. In the future it is desired to interleave full intensity operations to the AGS with low intensity operations to BAF. Therefore, understanding if any constraints are necessary for the Stub tunnel are important. The high intensity proton source has been RS LOTOed off pending review of procedures and potential faults created by accidentally injecting them into the Booster and subsequently into BAF (**CK-BAF-fy2003-protons-320**). The interlocks prevent this beam from being extracted to RHIC. However, the interlocks do not prevent it from being extracted into BAF.

CC:

RSC  
Present  
BAF File  
Booster file