

NAL PROPOSAL No.

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Proposal for Radiation Measurements Around  
a Proton Beam Dump at 300 GeV\*)

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\* The measurements proposed are essentially contained in NAL #108

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Proposal for radiation measurements around  
a proton beam dump at 300 GeV\*)

The estimation of particle flux densities, radiation heating and absorbed dose from the interactions of 300 GeV protons with beam line equipment are based on Monte Carlo calculations and extrapolations from experience at 30 GeV. The results obtained by computer codes developed at Oak Ridge, CERN and NAL agree essentially and the predictions from these calculations for the dose to components, the induced activities and the flux density patterns inside the beam tunnels are the same to within an order of magnitude.

Since CERN is still in the design stage for many of the beam transport and ejection components it would be of great importance to us if the validity of the calculations, which contain a great number of simplifications, could be checked in an experiment with a simple geometry at several hundred GeV. It has to be pointed out that this experiment will only need a few hours of the full primary beam at NAL and should be made at the earliest convenience to be of greatest use in guiding the decisions to be taken at CERN in the near future.

The programs for the simplest geometry deal with the case where a small well defined primary beam hits a cylindrical beam stopper which is large enough to allow the hadron cascade to develop fully. The predictions from the calculations give the density of inelastic events and the absorbed energy in the stopper material as a function of depth and radius. From this the particle fluxes (including  $\mu$ 's) escaping from the dump block and the induced activity in the block can be estimated.

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\*) The measurements proposed are essentially contained in NAL proposal 108.

NAL experiment 108 would cover all these aspects. If all measurements proposed in Exp. 108 cannot be scheduled in the near future, we would nevertheless underline the importance for the CERN 300 GeV project to do a first pilot experiment, i.e. a few measurements from the program proposed in Exp. 108. In addition, in order to simulate the situation of a beam loss in the accelerator, it would be interesting to measure the dose around a NAL magnet placed upstream the beam dump. Losses in the magnet can be produced by an Aluminium sheet 1/4" thick placed in the front part of the magnet.

About  $10^{15}$  protons (within not more than 8 hours) are necessary to obtain reasonable statistics for the flux, dose and activity measurements on the surface of the magnet and the dump block. All measurements are based on "passive" detectors : -

A. Absorbed energy

- i) Glass and TLD dosimeters
- ii) Thermocouples to measure temperature increase.

B. Flux densities

- i) Al foils ( $F^{18}$ )
- ii) Plastic scintillators ( $C^{11}$ )
- iii) Cu-foils ( $Na^{24}$ )

C. Induced activity

- i) Remanent dose rate at the surface and at 1 foot distance 0.5 h and 24 hours after beam-stop.
- ii) Analysis of samples 24 hours after exposure.
- iii) Long decay curves for some samples.

We would also like to include in this reduced program the energy deposition measurements proposed in the Addendum to proposal #108. These can be made in the same beam upstream the dump requiring only  $2 \times 10$  pulses of  $5 \cdot 10^{11}$  p energy in small Al and Fe cylinders.

All these measurements are of great importance to CERN. We would therefore like to ask for an allocation of a few hours of extracted proton beam (minimum 4 hours) to this experiment and to schedule it as early as possible. The spokesman for NAL would be M. Awschalom, the correspondent from CERN K. Goebel.