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Survival Test of Wires in H-20 Septum

E. Bleser

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Collider Accelerator Department

Brookhaven National Laboratory

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Experimenter(s) E. Bleser, R. Thern, K. Brown

Reported by E. Bleser

Subject Survival Test of Wires in H-20 Septum

Purpose

To see if the wires can survive a beam intensity equivalent to that which will be produced by the post-Booster AGS.

Theory

Losses on the H-20 septum are in principle, and to a good approximation in practice (Ref. 1), given by the formula (Ref. 2):

$$\text{Losses} = \frac{d}{s} f,$$

where:

d = wire diameter
= 0.002"

s = spiral pitch of extracted beam at septum
= 0.69 cm for normal extraction

f = factor to allow for beam divergence, etc.
= 1.5

As the non-resonant beam is moved closer to the septum, s decreases, increasing the losses. If the post-Booster beam is 5 times the present beam, increasing the losses by a factor of 5 should produce a proton intensity on the wires equivalent to that of the post-Booster AGS.

Experimental Procedure

1. Increase the H-20 bump.

2. Scan the bump to center the split in the beam on the F-5 septum.

Step 2 is necessary to protect the F-5 septum and because losses at F-5 appear on the H-20 loss monitor. This procedure was repeated a number of times until the H-20 loss monitor had increased from 0.7% to 3%, a factor of 4. The beam was run in this condition for 15 minutes.

The systematic scanning data is of some interest but was lost since it was not appreciated that file names are limited to 5 characters.

Another, although similar, experiment was carried out by reducing the spill length from 1.4 seconds to 0.3 seconds. The instantaneous loss rate was increased by a factor of 5, again approximating the post-Booster instantaneous intensity. We ran in this mode for one-half hour.

Results

The septum was observed through the upstream and downstream windows at the beginning and at the end of the experiment. No broken wires were seen on either occasion.

Follow-Up

1. A quantitative analysis of this experiment will be carried out.

2. This summer a sample of wires will be taken from the septum and tested to see if they have degraded from the initial conditions.

References

1. M. Tanaka, Extraction Group Physics Note #001, April 25, 1989 (Revised).
2. M. Tanaka, et al., AGS Studies Report No. 229, March 1, 1987.