

Scientific Spokesman:

W. Frati
University of Pennsylvania
Philadelphia, Pennsylvania
19104

Tel. (215) 594-5000

Proposal for a Further Search for Long Lived Particles at NAL

S. Frankel, W. Frati, L. Resvanis, W. Yang
University of Pennsylvania

F. Nezrick
National Accelerator Laboratory

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PROPOSAL FOR A FURTHER SEARCH FOR LONG LIVED PARTICLES AT NAL

S. Frankel, W. Frati, L. Resvanis, and W. Yang, (University of Pennsylvania)

F. Nezzrick (NAL)

We have recently completed and sent off for publication a search for long lived particles produced by 300 BeV and 400 BeV protons at NAL. This search was sensitive for lifetimes in the region of approximately 1 to 1,000 hours, and resulted in upper limits on cross sections from production and capture of less than a micro-micro barn.

We would like to use the same electronic apparatus now existing at NAL and a new Cherenkov counter to push this search down to particles in the milli-second to one hour lifetime region.

Our method of using a directional gas Cherenkov counter, aimed down at targets from above, to reduce cosmic ray coincidences, has proved to be the key for low background searches for new particles. Our present plan is to use the pipe that passes through the berm above the target in nu-hall. It is our plan to lower a twenty-foot long atmospheric pressure gas Cherenkov counter tube down the hole and to look for particles between beam bursts. Because we are using a gas Cherenkov counter, radio-activity and non-relativistic particles will not produce any counts, and hence there will be no confusing background. Cosmic ray events should be very rare in this counter, perhaps one per week.

We would gate on our apparatus to look between beam bursts for particles that are ultra-relativistic. Massive particles, stopping in the target, which decayed into π^0 's or gamma rays, would convert in a radiator at the entrance window to our Cherenkov counter. The counter would also be sensitive to pions produced in the decay of massive particles.

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This experiment would be a parasitic experiment; it would not take up any present floor space, nor would it require any special properties of the beam. We would simply be using the 90° nu-hall monitor tube.

Once our apparatus is running with beam on, which should take perhaps a day or two of debugging, we would like to take data for a few days, whenever it is convenient for the accelerator.

The counter is simply a thin pipe which will slide down the present 90° monitor pipe. It would be filled with atmospheric pressure, SF-6. The upper section of the Cherenkov counter has a group of five inch phototubes each examining light from the same event.

We would need no new apparatus from the NAL electronics pool, except for a pre-det so that we can gate on our apparatus at the appropriate times.

Our counting equipment would be moved from its present location in building 7 to available space in a trailer now used by one of us, (F. Nezzrick).

We expect that, if beam is running in nu-hall, it will take less than ten days to install, test, search and leave.