COMMENTS ON THE HEIGHT OF SECONDARY BEAMS

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ABSTRACT

The height of counter/spark-chamber beams above the experimental-hall floor is discussed, and it is concluded that the optimum height is between 6-1/2 ft and 8 ft.

This note arises from discussions among a number of counter/spark-chamber physicists at the Summer Study regarding the optimum height of beams above the experimental-hall floor. The discussion arose after seeing a very preliminary drawing of an experimental area where the beam height appeared to be about 5 feet. We are only considering the area in the region of experiments (typically Area E2) and not the EPB target area.

A number of considerations which affect beam height can be given. A lower beam height has economic advantages for beams intense enough to require much radiation shielding intensities of $> 10^7$/pulse. With beam lengths as given in the NAL 1968 and 1969 Summer Studies, such shielding can be expensive and also involve considerable rigging when changed; with a lower beam height, less shielding is required. However, most beams for counters and spark chambers are of lower intensity ($\lesssim 10^6$/pulse) and if the beam height is greater than that of a man, the shielding problem does not arise in many cases; beams at the AGS of $\sim 10^6$/pulse do not need radiation shielding (they have a wooden safety fence a few feet away) since it is much more difficult for a person to inadvertently get directly into the beam line. Beam heights that are too great can again be costly, since false floors etc. underneath small pieces of experimental equipment are needed, and provision must be made for an experimenter to service his equipment.

Another consideration is the increasing vertical aperture of experimental magnets and the need for an adequate amount of iron yoke underneath the aperture. One example is the AGS 120D36 magnet, with a two-foot vertical aperture, which can be used in the main experimental hall where the beam height is 6-1/2 feet but not in the old hall where the height is 5 feet. This may be increasingly important as several large magnets have been discussed in the Summer Study for experiments at NAL.

Although a hole in the floor can always be made for such a large magnet, this is unlikely to be done frequently, and such a requirement can reduce flexibility in scheduling the magnet for different beams.

We note that most existing high-energy accelerators have a beam height about 5 feet while a smaller number (principally Bevatron, SLAC, and AGS) have heights 6-1/2 feet or greater. However, discussions indicate that experimentalists working at the first group of laboratories often would have preferred a greater beam height. The consensus appears to be that a height in the range 6-1/2 feet to 8 feet seems optimum because of reduction in the radiation problem. Beams of typical intensities which are above head height need less shielding; experimental equipment is getting larger so that a height of about 5 feet may cause unnecessary restrictions on the size of some pieces of equipment.