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COPY

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Berkeley,
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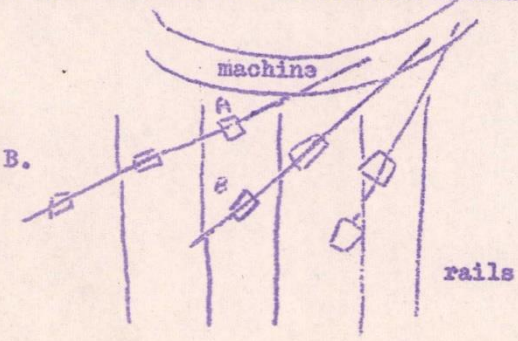
Dear Pickavance,

I hope the enclosed pamphlet is of some use to you. It is based on beam intensities that have been observed in actual experiments on the Bevatron, normalised to give the intensity of secondaries at the internal target per 10^{10} incident protons. In practice 1-2 x 10^{11} protons per pulse can be obtained at full intensity. In order to get a low energy separated (electrostatically) K beam the length of the flight path through the separators and bending and focussing magnets cannot be made short, so one loses a lot by decay in flight. It has been found better to separate a beam at say 750 Mev/c and then slow it down after separation to get the low energy you want. Presumably it will eventually become feasible to separate higher momentum beams (perhaps using glass electrode separators) without too much trouble. In that case a machine that produced only low energy K's would not have any advantage in this respect to outweigh the great disadvantage of not being able to do a lot of other experiments. One experiment requiring > 1 Gev/c is $K^- + p \rightarrow \equiv^{(n)} -,^o + K^+,^o$; it would be a pity to abandon a possible source of $\equiv$ particles.

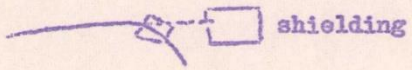
As for the beam intensity of some future machine, presumably an AGS, is it necessarily true that higher energy means lower intensity? From what I have heard it seems that the space charge limit to beam intensity actually goes up with the radius of the machine (keeping the injection energy constant).

I have just heard that the Brookhaven injector is delivering a 50 MeV beam (of unknown intensity), with RF power to spare. They expect to start injecting beams next month.

A series of meetings is being held here to discuss the Bevatron improvement programme; so far shielding and experimental facilities have been discussed. A figure of 10^{13} protons per pulse is mentioned very tentatively - not by the people responsible for the new injector, however! It is planned to put 7 ft. of concrete on top of the machine (at present only the target straight section has roof shielding) in blocks of segment $1\frac{1}{2}^o$ to $1\frac{1}{4}^o$. All the walls will be increased to 10 feet thick, giving a total weight of shielding of 14,000 tons compared with the present 4,000 tons. New foundation pillars will be required. A great deal of discussion went on about the beam "slot". A slot 6 ft. high was proposed, the wall above and below consisting of large blocks, while some creeping device is used to slide tables in with magnets, etc. into and through the wall without removing the roof. The roof would be supported on movable vertical iron plates at intervals of about 10 feet. Many people thought that this would have no advantage over the present system of dismantling the whole wall from above. A system of rails or cranes running perpendicular to the machine was considered to have one very serious disadvantage, in that most of the magnets could not be removed without disturbing other beams.



Perhaps diagonal rails (this way ///) in addition would solve this problem. Additional supporting and bracing structures will be put in the centre of the machine. Some people asked about the usefulness of the centre for experiments on positive beams; one gets good optics and high intensity. No one was very enthusiastic about it, however. It has been used once by Moyer's group. For the external proton beam extra shielding would be necessary downstream from any target and also to stop the beam when a magnet fails:



The usefulness of the external beam was questioned (its large size will give bad secondary beam optics). Segré pointed out that it is essential for studying particle production processes.

The present experimental area will be expanded to provide longer flight paths, and one new area will be constructed. The inventory of magnets and separators will be increased to three times the present value, and auxiliary power supplies will be increased to give double the present power. The new supplies will be in small increments for greater overall efficiency.

Next week the new injector will be discussed. Hugh Hereward from CERN is spending a few months here to help in the injector design.

The time scale is that the whole programme should take about three years, including a four month shutdown to install the shielding and injector.

My own work is going very well. Our spark chamber is giving very good tracks, and its time resolution is about 0.5μs. The efficiency of a single pair of plates is approximately 99%. It should be particularly useful for measuring the polarisation of protons in coincidence with something else. The particular experiment we have in mind is a measurement of the polarisation of the protons from hyperon decay, selected by detecting the K^+ in $\pi + p \rightarrow \Sigma^+ + K^+$, $\Sigma^+ \rightarrow p + \pi^0$.

Yours sincerely,

Paul Murphy