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PROPOSAL FOR A K^+ -PROTON EXPERIMENT AT 10 GeV/c

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1. Proposal

We wish to propose an experiment on the interactions of K^+ mesons with protons at a momentum of 10 GeV/c using the 2m HBC in the U1 beam. The number of photographs required initially would be about 200,000, probably followed by a second similar run at a later date, and it would be most desirable to start the first K^+ run in the autumn of this year or the early months of 1966.

2. Aims of the Experiment

The interactions of K mesons with protons have been or are in the process of being studied at momenta up to 6 GeV/c. In addition, experiments with K^- mesons are in progress at 10 GeV/c and proposed for 14 GeV/c. The extension of the K^- experiments to the higher energies has been argued on the general desirability of exploring the new region using the facility of the R.F. separated beam which is at present unique to CERN. It seems clear that the opportunities which will be presented by the U1 beam and the 2m chamber should be exploited to the full for both K^- and K^+ particles, and that it is advantageous to have experiments with both K^+ and K^- under the same conditions.

Turning more particularly to the K^+ proposal, the following studies are important :

1. Resonance studies : systems are readily accessible with :

S = 0, +1 for YK, YKK

S = +2 for KK

S = +1 for NK

S = +1 for π K

2. Antihyperon production : Strangeness +1 antihyperons will be produced with and without associated K mesons. We are also very much above the threshold for production of strangeness +2 antihyperons. (Even the anti-omega may be produced having a threshold momentum of 7.6 GeV/c.) Thus studies may be made of the properties and resonance associations of the antihyperons.

3. Production mechanism : In all recent high energy studies peripheral processes have proved to be of great importance and have enabled successful analysis of the results to be made in terms of well-defined models. It is certainly of interest to carry these studies into the higher energy region.

3. Number of Photographs

If we assume say $10 K^+$ per photograph, which should certainly be possible on the basis of measurements in the O2 beam, and allow 120 cm of the bubble chamber as a production region, we have $1.2 \cdot 10^8$ cm of track per 10^5 photographs yielding 4,000 events per mb. of cross-section. Typical cross-sections in this region will probably be 0.1 mb. so that a run of $2 \cdot 10^5$ photographs would yield 800 events which is a reasonable number required to study a reaction channel.

4. Collaboration and Measurement Capacity

A similar proposal for a high energy K^+ experiment was made by the Birmingham group for the 1.5 m BNHBC and we are mutually agreeable to collaboration in such work. We will shortly have available between these two groups 6 IEP-type machines, while in the first months of 1966 we will commission three S.M.P.'s, two of which could be available in this work. Two of the IEP's are currently operated overnight as well as during the day. By the end of this year we expect to have also film from the K^- -D experiment planned for Nimrod and estimate that some 60% of the above capacity would be available for the high energy experiment. On this experiment this represents a capacity of 30,000 - 40,000 events in 1966.