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CRACOW EMULSION EXPOSURE TO 200 GeV PIONS

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September 2, 1974

We are asking for the exposure of two small nuclear emulsion stacks to 200 GeV negative /or positive/ pion beam at NAL.

Physics interest.

In the last two years we were dealing with the interactions of 67 GeV, 200 GeV and about 3000 GeV protons with the nuclei of photographic emulsion. The results of the analysis performed have been summarized in our papers /1/ and recently presented at the London Conference /2/.

One of the main results which follows from our analysis is that independently of the energy of the incident proton the angular distribution of produced particles can be separated into two components:

1. Component "A" which does not depend neither on the target nucleus nor its degree of excitation. This component is very similar to that observed in p-p collision.

2. Component "B" which depends on the excitation of the target nucleus.

The relative behaviour of these two components in function of the incident proton energy is in favour of the concepts which suggest that the multiple production process goes through the production of intermediate state /or states/ which behaves differently than the particles observed in the final state. Thus the proton-nucleus encounter reveals the properties of the intermediate states in case when they are produced by primary proton.

It seems for us very interesting to perform similar analysis with primary pions and to investigate in the same way the properties of the hypothetical intermediate states in case when they are produced by primary pion. We know quite a lot about the final states in p-p and π -p interactions, a little about the final states in proton-nucleus interactions and practically nothing in case of π -nucleus interactions.

It may occur that the method described above when applied to the analysis of the final states in proton-nucleus and π -nucleus interactions may easily detect differences between them /if they exist/. This is due to the fact that the component "B"

seems to be more sensitive for detecting such differences than the angular distribution taken as the whole which is the sum of the two components "A" and "B". We hope that in this way we can learn something more about the properties of the intermediate states produced in p-p and π -p encounter.

At present we have data from interactions of negative pions /60 GeV/ with the nuclei of photographic emulsion/3/. In case of 200 GeV pion exposure /which we are asking for / we will have a complete set of data needed for making a comparison between proton-nucleus and pion-nucleus interactions at the same two different primary energies.

Technical details:

We would like to expose to the 200 GeV pion beam 2 stacks of Ilford G5 stripped pellicles. Each stack will contain about 30 pellicles /600 μ thick/ with the dimensions 1.5 x 2.5 inches. The pion beam should be parallel to the emulsion plates within the accuracy at least 10 mrad. in order to ensure the enough length per plate of the primary pion tracks. The stacks will be mounted in plastic containers with an engraved straight line parallel to the pellicles. This line will be used for the optical adjustment of the stack.

The optimum density of pion tracks should be between $5 \times 10^4/\text{cm}^2$ and $3 \times 10^5/\text{cm}^2$ at the entrance side of the stack.

The emulsion pellicles will be processed at Lawrence Radiation Laboratory in Berkeley.

Scanning and measurements

We intend to collect an unbiased sample of about 1000 interactions by systematic following under the microscope the primary pion tracks. In each interaction the measurement of multiplicity and the angular distribution will be done.

Scanning, measurements and the analysis of the data will be performed in our laboratory in Cracow.

References.

1. J.Babecki et al. Physics Letters B47,268/1973/.
J.Babecki et al. Acta Physica Polonica,B5,315/1974/.
R.Hołyński et al. Acta Physica Polonica,B5,321/1974/.
2. XVII International Conference on High Energy Physics,
London, July 1974.
3. Alma-Ata - Budapest - Cracow - Dubna - Moscow - Sofia -
Tashkent - Ulan Bator Collaboration, Physics Letters,B31,237/1970/.
Alma-Ata - Budapest - Cracow - Dubna - Moscow - Sofia -
Tashkent - Ulan Bator Collaboration, Physics Letters,B31,241/1970/.
B.Furmańska et al. Acta Physica Polonica,B4,81/1973/.