NAL PROPOSAL No. 183

Scientific Spokesman:

M. I. Tretyakova
Laboratory of Cosmic Rays
Lebedev Physical Institute
Leninsky Prospect 53
Moscow, USSR

A PROPOSAL OF THE PHOTOEMULSION EXPERIMENT AT THE NATIONAL ACCELERATOR LABORATORY (BATAVIA)

(Alma-Ata - Moscow - Leningrad - Tashkent - collaboration)

N.A. Dobrotin, G.B. Zhdanov, M.I. Tretyakova

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ACADEMY OF SCIENCES OF THE USSR
P.N. Lebedev Physical Institute

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1. a) The experiments using a cloud chamber in a magnetic field and anionizing calorimeter exposed in cosmic rays have been performed at the Lebedev Physical Institute I 1-3 I. They have shown that the hadron interactions with a LiH target at the energies of 200-700 Gev can be explained on the basis of the fireball model, supposing one fireball formation in a peripherical process, for about 50 per cent of events. The experiments carried out at the accelerator beams using the photoemulsion method at CERN (Eo = 21-24 Gev) I 4 I and at Serpukhov (Eo = 60 Gev) I 5 I have indicated that the same model can describe the essential part of the pN-and πN - interactions (the quasi-free nucleon interactions are selected with the help of the criteria, approbated at the energies of $\sim$20 Gev).

It seems to be very important to continue this photoemulsion experiment at the energies of 200-500 Gev at the Batavia accelerator retaining the previous method of selecting the quasi-free nucleon interactions and measuring besides the emission angles of the charged particles also the momenta of these particles by their Coulomb scattering. Under the favourable conditions of exposure of the Soviet emulsions one can expect the value of the measurement precision of the particles momenta to be $\sim$ 30 per cent at the particle momenta values p $\sim$ 30-50 Gev/c.

This expected precision, at least, will not be worse than that obtained in the last experiments I 1-3 I, having an advantage of a much better angular resolution, an unambiguous determination of the nature and energy of the primary particles and better statistics.

So we hope to realize a new more reliable check of the fire-ball model application and also any other model concerning the multiple production of particles.

b) The second scientific problem consists of a studying the energetic dependsnce of the cross-section of the coherent generation of one, three, five and so on charged particles on the photoemulsion nuclei at the proton and π-meson energies of 200-500 Gev and of comparing that with the corresponding data, obtained at the energies of 20-70 Gev.

2. The requirements to the photoemulsion stacks exposure:

a) the protons and pions beams at the energy of 200 Gev and higher, at the maximum accesible one.

b) the total density of the beam within $2 - 4.10^4$ cm^{-2}:

c) the dip angle to the plane of the emulsion layer has to be minimum, but advisable not more than 5.10^{-3}.

d) on the condition that the beam angle dispersion will not be more than $0.5.10^{-3}$ it's desirable to take some control irradiation of the same stacks perpendicular to the emulsion plane to estimate the distortion level. The particles density must be about 10^5 cm^{-2}.

3. It's advisable to irradiate 2-3 photoemulsion stacks (of a volume of about 1 litre each) with the protons and pions beams at the energy of 200 Gev and higher, at the maximum accesible one.

4. For the control of development quality it's necessary to have some possibility to develop a small quantity of the photoemulsion layers during the preparation and exposures at Batavia.

5. We ask to consider Dr. V.A. Nikitin as a responsible person for the photoemulsion exposure during his stay at the NAL.

6. Please send all the information about the performing of this photoemulsion experiment to Dr. M.I.Tretyakova,

Laboratory of cosmic rays, Lebedev Physical Institute,
Leninsky prospect 53, Moscow, USSR.

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N. Dobrotin

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M. Tretyakova

G. Zhdanov