SEARCH FOR CORRELATED GROUPS OF PARTICLES PRODUCED IN INTERACTIONS OF NEON-22 NUCLEUS WITH NUCLEI IN PHOTOEMULSION

F. G. Lepekhin, B. B. Simonov

We have already reported about the observation of collective effects occurring in the interactions of ^{22}Ne nucleus with nuclei in photoemulsion /1—2/.

The present work gives an analysis of 4309 inelastic interactions of relativistic ^{22}Ne nucleus with nuclei in photoemulsion at 4.1 A GeV/c with the aim of finding jets of produced particles, correlated groups of single-charged relativistic s-particles with close angles in ordinary space. A search for these groups was made with the help of an algorithm in which the probablity P of the appearance of a group of particles in a separate event with the multiplicity n_s is estimated at measured values of the polar Θ and azimuthal Ψ angles of particles.

As a result algorithm application for the chosen 2097 experimental events with multiplicities $n_s>6$, 177 events have been found, each of them contains a jet of 2 particles (K=1), fitting the condition $P<P_c$ (P_c — a critical value of probability P was taken equal to 10^{-8}), 21 events containing 3 (K=2), and 11 events containing 4 particles (K=3) fitting the same condition, each of these groups being not a compound part of the next group, that is, the described 2 — particle jet is not a part of the 3 — particle and 4 — particle jets etc. When modelling according to the Independent Emission Model (IEM) 10 ensembles of events, where the distribution of value n_s is identical to the experimental one, there occurred 87.5 (K=1), 5.3 (K=2) and 2.0 (K=3) events corresponding to each performed ensemble. Thus 209 events with jets have been found in the experiment and in the IEM-94.8.

The difference between the experiment and the model for the events containing jets of 2, 3, 4 particles is statistically significant.

Besides, it appeared (table) that the average multiplicities of single-charged projectile fragments (s′) — particles and target fragments gray (g) and black (b) particles are equal in the events with jets and in all the interactions subjected to the search. However, the average multiplicities for the multicharged projectile fragments — g′ and b′ particles appeared to be lower in the jet events. On the contrary, the average multiplicities of produced particles in the jet events appeared to be higher ($24.01\pm+0.79$) as compared with those of the events with $n_s>6$ (18.62 ± 0.22).

Table

Type of fragments	Average multiplicities of jet events	Average multiplicities of events with $n_s>6$	Average multiplicities All events
s′(Z=1)	1.44±0.11	1.77±0.03	1.49±0.02
g′(Z=2)	0.44±0.05	0.68±0.02	0.81±0.02
b′(Z⩾3)	0.08±0.02	0.16±0.01	0.49±0.01
s	24.01±0.79	18.62±0.22	10.33±0.17
g	13.76±0.70	11.01±0.20	8.21±0.13
b	6.79±0.30	6.46±0.10	4.16±0.07
h(g+b)	20.54±0.88	17.46±0.27	10.36±0.18
Number of events	209	2097	4309

The experimental angular distribution (fig.) of the jet axis is normal with the average Y=1.62 and standard deviation $S_Y=1.20$ (points). Here Y is quasirapidity $Y=-\ln(\mathrm{tg}\,\Theta_0/2)$, Θ_0 — polar angle of axis. The angular distribution of all produced s-particles in 2097 experimental events with $n_s>6$ (solid histogram) is shown.

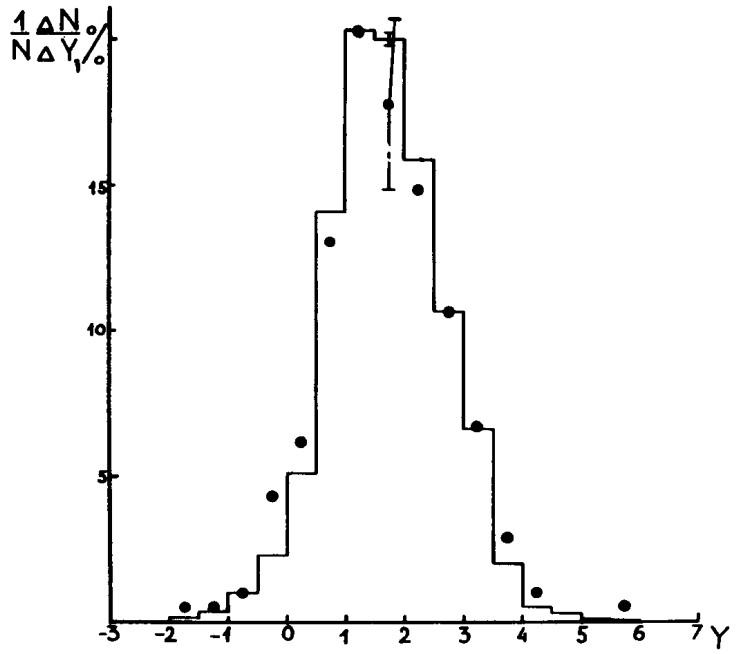

Fig.

REFERENCES

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