SEARCH FOR BARYON AND DIBARYON RESONANCES EFFECTS IN $(p,2p)$-REACTION ON LIGHT NUCLEI AT 1 GeV ACCOMPANIED BY CUMULATIVE PROTONS

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The correlation experiments are necessary to understand the intricate phenomena in nuclei matterare responsible for the cumulative particle production. In such experiments the cumulative b-particle should be measured in the coincidence with the *f*-particle going to the forward hemisphere. The momentum correlation of *b*- and *f*-particles may be influenced by the existence of the unusual objects inside nuclei along with the production and the subsequent interaction of the Δ-isobar with one of the nucleons ($\Delta + N \rightarrow N_f + N_b$). Such a two-step process is probably important for fast *b*-particle production: the surplus isobar energy ($\approx 300\ MeV$) can be shared with two nucleons and one of them has a chance to go into cumulative area. The observation of the Δ-isobar effects in cumulative processes is also interesting from the point of view of its

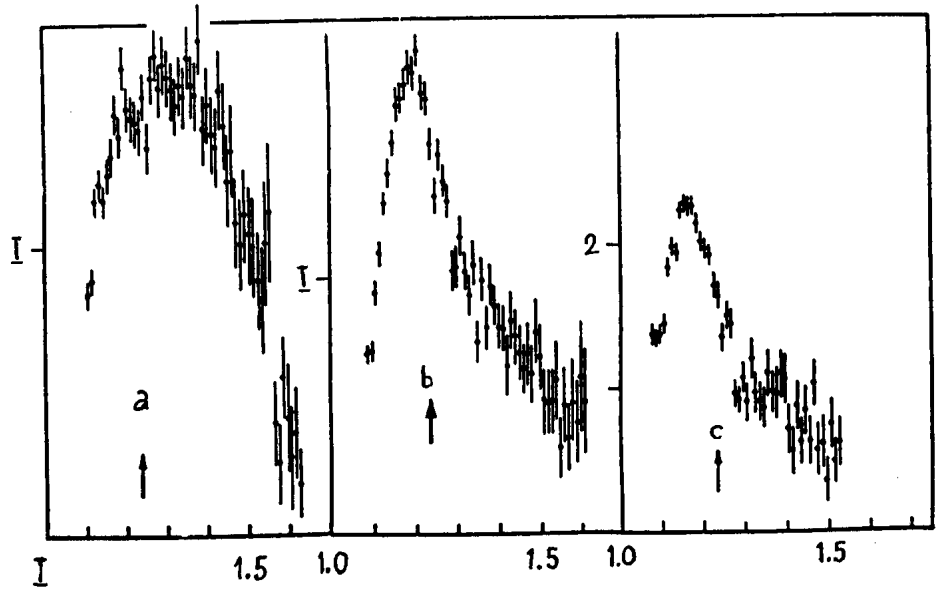

Fig.1. Intermediate particle correlator at *a*) $\Theta_f = 25^0$, *b*) $\Theta_f = 39.5^0$, c) $\Theta_f = 65^0$; arrow shows position of Δ (1232)-isobar

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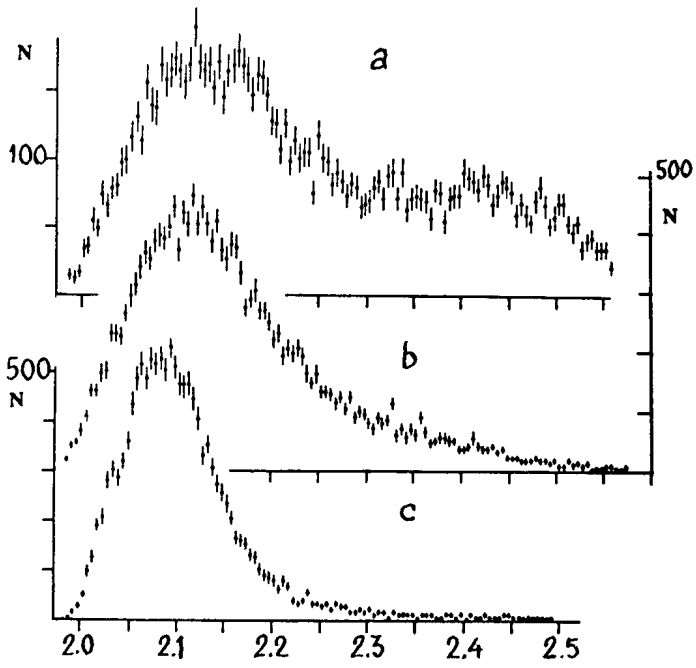

Fig.2. Effective mass spectra of *b*- and *f*-protons in $p\,^{Li}$-interactions at 1 GeV at a) $\Theta_f = 25^0$, b) $\Theta_f = 39.5^0$ c) $\Theta_f = 65^0$

Recently a lot of indications concerning the new (from the standard nuclear physics point of view) objects —the dibaryon resonances — have been found out in the various processes initiated by leptons, hadrons and nuclei. However the experimental situation is not clear.

On the one hand, the cumulative particle production may be due to the many quark configurations (dibaryons) inside nuclei; on the other hand, they may be closely connected with the $N\Delta$-dynamics. One can hope to observe the exotic long-living quark associations in the deep-inelastic reactions. The long life time may be caused by their quantum numbers which are forbidden for the free NN-system. But their production is possible in the nuclear processes since the residual nucleus can provide the conservation laws. On that reason the conditions which are necessary for the existence of long-living objects can be realized in some nuclear subsystem in the deep-inelastic hadron-nucleus interaction provided by cumulative nucleons production.

The investigation of the $p + {}^6\mathrm{Li} \to p_b + p_1 + \ldots$ reaction [1—3] has been aimed to studying the energy correlation of *b*- and *f*-protons and the mass spectrum of the intermediate particle to reveal the role of Δ-isobar in cumulative processes. In addition the effective mass spectrum of *b*- and *f*-protons was also considered to search for narrow structures.

Two time-of-flight scintillation spectrometers have been used to measure the momenta of *b*- and *f*-protons (TOF distance $\approx 10\,m$). Both spectrometers consisted of 5 position-sensitive detectors ($1\times0.2\times0.2\,m^3$ each) and had a large angular acceptance ($\Delta\Omega \approx 10^{-2}$).

The isobar signal was observed both in the energy correlations of the final particles and in the intermediate particle mass spectra (M). The last one was normalized to the combination mass (M_x^c) distribution: $R(M)=(dN/dM)/(dN/dM_x^c)$. The value M_x^c has been calculated in accordance with the momenta of *b*- and *f*-protons taken out of the different inclusive events. The normalized distribution density R(M) must be constant if the *bf*-correlation is absent. The R(M) distribution is represented in fig.1. The peak near the isobar mass is clearly seen in fig.1-*b,c* and it has the typical isobar width. This effect gives evidence in favour of the experimental observation of the isobar mechanism of the cumulative proton production.

The effective mass spectra of *b*- and *f*-protons are represented in fig.2. There are no evidence for the narrow dibaryon resonances. Then the effective mass spectra were built for different dibaryon production angle to strengthen the selection criteria at the expense of the dibaryon production kinematics. However it did not help to display any reliable dibaryon signals. The total production cross section corresponding to the peak with the amplitude of 4 standard deviations centered at 2.155 GeV/c^2 with the width 20 MeV/c^2 would be $\approx 4\mu b$.

References

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