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ЕРЕВАНСКИЙ ФИЗИЧЕСКИЙ ИНСТИТУТ

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ANGULAR DEPENDENCE OF THE YIELD OF CUMULATIVE PROTONS
PRODUCED IN γA -INTERACTIONS AT $E_{\gamma}^{\max} = 4.5$ GEV

ԵՐԵՎԱՆ 1982 ԵՐԵՎԱՆ

We have shown in our preceding papers [1,2] that the angular dependence of protons yield from the nuclei ^{12}C , ^{63}Cu , ^{208}Pb , irradiated with bremsstrahlung γ -quanta with maximum energy 4.5 GeV is a forward type which increases with the proton energy, and in the region $\nu > 140^\circ$ a tendency of flattening is observed. In these measurements the maximum detection angle was 160° and it was caused by the dimensions of the range detector used [3]. In similar investigations with primary hadrons with a momentum 8.6 GeV/c some detailed structure was observed [4] in the angular dependence of the yield of protons and $\bar{\pi}$ -mesons in the region of angles $165^\circ + 170^\circ$. Such structures (minimums) aren't expected from the viewpoint of overwhelming majority of theoretical models attempting to explain cumulative particle production. Therefore, it is very important to find out whether there occur irregularities in the angular distribution of the yield of protons (and other particles) produced by high-energy γ -quanta.

In this paper we present new data on angular dependence of the yield of protons from the nuclei ^{12}C , ^{63}Cu , ^{208}Pb irradiated with bremsstrahlung γ -quanta with a maximum energy

4.5 GeV. The investigated interval of outlet angle is widened to $\vartheta = 175^\circ$.

The results are obtained on the beam $\Gamma - 3$ of the Yerevan electron synchrotron by means of the experimental setup "Deuteron" [5].

Protons were identified with a magnetic spectrometer by measuring the time of flight. The momenta were measured in the interval $P = (0.4 + 0.8)$ GeV/c with relative spreads $\Delta P/P = \pm 11\%$, the time of flight in the interval is equal to $\tau = (13.8 + 5.5)$ nsec with relative spreads $\Delta\tau/\tau = (4.9 + 2.6)\%$. The mentioned resolutions allowed to separate with 100% efficiency protons from other positively charged particles, in the main - from π -mesons [5].

In figs. 1,2,3 the dependences of invariant cross sections on the proton detection angle are presented for the nuclei ^{12}C , ^{63}Cu , ^{208}Pb , respectively. Angular distributions for each nucleus are obtained at four values of proton momenta - 0.4, 0.5, 0.6 and 0.8 GeV/c.

The data depicted in figures show that within the limits of statistical errors no noticeable structures for all nuclei and all momenta are observed. At the same time there is a rather convincing evidence of the presence of a flattening in the region of angles $\vartheta > 140^\circ$.

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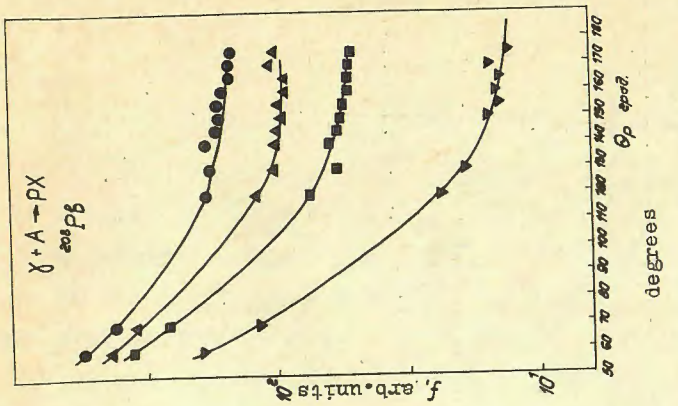


Fig. 3

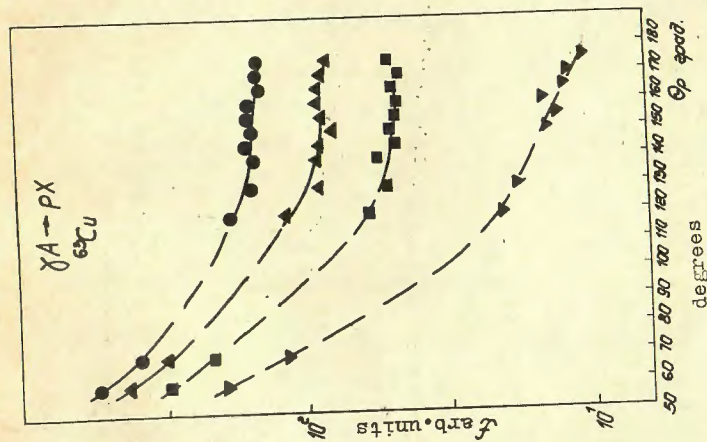


Fig. 2

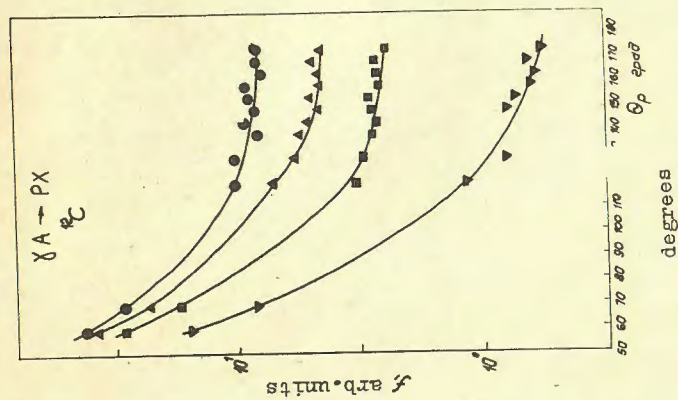


Fig. 1

Figure Captions

Fig. 1 Angular dependences of the invariant yield of the reaction $\gamma^{12}\text{C} \rightarrow pX$ at $E_{\gamma}^{\text{max}} = 4.5$ GeV for the following values of momenta p : \bullet - 0.4, \blacktriangle - 0.5, \blacksquare - 0.6, \blacktriangledown - 0.8 GeV/c. Lines are drawn via experimental points "by eye".

Fig. 2 The same as in fig. 1, only for ^{63}Cu .

Fig. 3 The same as in fig. 1, only for ^{208}Pb .

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УГЛОВАЯ ЗАВИСИМОСТЬ ВЫХОДА КУМУЛЯТИВНЫХ ПРОТОНОВ,
ОБРАЗОВАННЫХ В γA -ВЗАИМОДЕЙСТВИЯХ ПРИ
 $E_{\gamma}^{\max} = 4.5$ ГэВ

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