

PHENOMENOLOGICAL CHARACTERISTIC OF THE ELECTRON
COMPONENT IN GAMMA-QUANTA INITIATED SHOWERS

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ABSTRACT

The phenomenological characteristics of the electron component in showers initiated by primary gamma-quanta were analyzed on the basis of the Tien Shan experimental data. It is shown that the lateral distribution of the electrons in gamma-quanta initiated showers can be described with NKG - function with age parameter $\bar{S} = 0,76 \pm 0,02$, different from the same parameter for normal showers with the same size $\bar{S} = 0,85 \pm 0,01$. The lateral distribution of the correspondent electron energy flux in gamma-quanta initiated showers is steeper as in normal EAS.

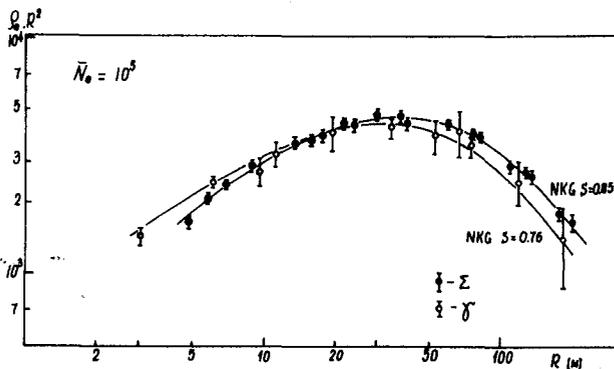
I. Introduction

The phenomenological characteristics of the electron component of EAS contains information about the primary particle which has initiated the shower /1,3/. Particularly, the muon and hadron components in the extensive air showers, generated by primary gamma-quanta, are practically absent because the photonuclear processes cross-section are relatively small in comparison with the hadron-hadron interactions cross-sections, which are responsible for the normal showers.

In our earlier papers /4-6/ the investigation results are discussed of primary gamma-quanta with energy of $\sim 10^{15}$ eV with the help of the method of muon and hadron poor-shower selection on the basis of the Tien Shan experimental data, obtained during an effective running time $\sim 1,8 \cdot 10^4$ h.

2. Results

The lateral distributions of the electron flux in the selected muon and hadron poor-showers were described in the distance interval $5 \div 180$ m from the axis by means of standard NKG-function with age parameter $\bar{S}_L = 0,76 \pm 0,02$. On

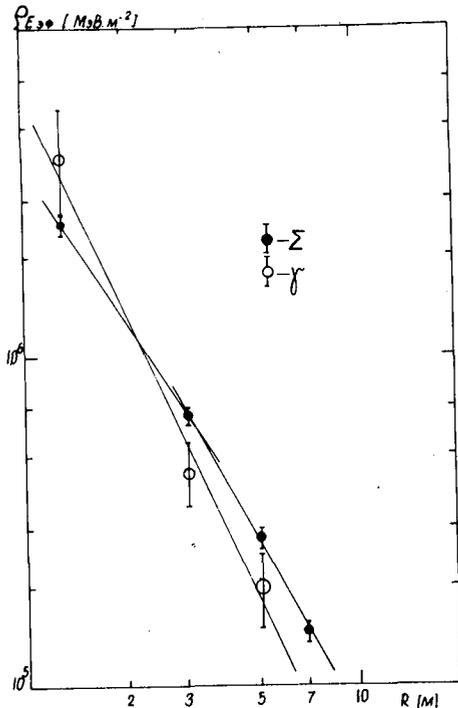


the other hand, the normal showers with the same size have electron lateral distribution, characterized with the age parameter $\bar{S}_L = 0,85 \pm 0,01$. In this case, the gamma-initiated showers are also younger than

the showers with the same size but generated by primary nucleons and nuclei. Taking into account the relation $S = S_L + \Delta S$, where $\Delta S = 0,15 \div 0,20$ /7/, it is necessary to suppose that the development maximum of the gamma-initiated showers is localized deeper in the atmosphere. This supposition is confirmed by the comparison of the experimental data /8/ about the height of the maximum in proton initiated showers with energy 10^{15} eV - $X_{\max} \approx 450 \text{ g.cm}^{-2}$ with the cal-

ulation result for the electron-photon cascades in the atmosphere, assuming the same energy of the primary photon - $X_{\max} \approx 600 \text{ g.cm}^{-2}$ /9/.

The lateral distribution of the electron energy flux in gamma-initiated and normal showers were analyzed too in the distance interval $0,2 < r < 5 \text{ m}$ /fig.2/.



It is shown that the lateral distribution in normal proton or nuclei initiated showers were described by the same functions as in /10/:

$$\rho_{E_{ef}} \sim r^{-1,53} \quad 0,2 < r < 3 \text{ m}$$

$$\rho_{E_{ef}} \sim r^{-1,9} \quad 3 \text{ m} < r < 7 \text{ m}$$

but in gamma-initiated showers

$$\rho_{E_{ef}} \sim r^{-2,0} \quad 0,2 < r < 3 \text{ m.}$$

The absence of flattening of the lateral distribution of the energy flux in the central part of the pure electromagnetic showers is a natural consequence of the absence of transverse momenta of secondary hadrons in the high energy hadron interactions.

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