

OBSERVATION OF NUCLEI WITH ENERGIES 8-30 MeV PER NUCLEON
IN THE EARTH'S MAGNETOSPHERE AT THE ALTITUDES 350 KM

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ABSTRACT

Observations of the flux of nuclei with an energy of 10 MeV per nucleon on the Salyut-7 Station in September 1984 are presented. The observed flux is smaller by a factor of 50 than the flux detected in May, 1981.

I. Introduction. We continue investigations of the fluxes of nuclei with energies of 8-30 MeV per nucleon in the orbits of scientific stations (inclination $\sim 50^\circ$, height ~ 350 km). The noted nuclei cannot get into these orbits from the interplanetary space because of the insufficient magnetic rigidity. In ref. /1/ the nuclei observed in 1973/74 year were interpreted as the particles of the anomalous cosmic ray component which, according to ref. /2/, are the singly-charged atoms. Our preceding experiment performed in May, 1981 /3/ speaks in favour of the magnetospheric origin of the observed particles, which was first suggested in ref. /4/.

This paper reports the preliminary results of a new experiment made with the improved technique enables one both to measure the flux of nuclei and to fix the registration point in the orbit.

2. Experiment. We used an instrument with 3 stacks of 3.7×12.5 cm² dielectric track detectors. Each stack contained 10 sheets CN-85 of 100 μ m thick and was protected against the ultraviolet solar radiation by two layers of aluminized lavsan film 1.4 mg/cm² in total thickness. During the experiment the 3 mm thick Al screen was displaced above two stacks (No.1 and No.2) to cover one of them depending on the value of proton flux incident upon the instrument. In the region of the Brasil magnetic anomaly when the proton flux ex-

ceeded $10^2 \text{ cm}^{-2} \text{ sec}^{-1}$ the screen covered the stack No.1 and the nuclei were detected with the stack No.2. Outside the Brasil magnetic anomaly the screen covered the stack No.2 and the nuclei were detected with No.1. The stack No.3 was open throughout the exposure time. The overall weight of the instrument with the self-contained power supply and detectors was $\sim 2 \text{ kg}$.

The instrument was delivered into the orbit on August 15, 1984. On September 19 the instrument was installed in the Salyut-7 lock-chamber and was exposed to space. The exposure time was 132 hours. On October 2, 1984 the detectors were returned to the Earth.

3. Analysis. The detectors were etched and the developed tracks were analysed. In each stack we revealed about a hundred of nuclei most of which got into the stacks during the 43-day storage within the station. These so-called "background" tracks are produced by the nuclei with an energy of several hundreds of MeVs per nucleon in outer space. Being decelerated in the walls and matter of the station elements, some nuclei possessing an energy $< 25 \text{ MeV}$ per nucleon, arrived at the detectors and came to rest in the cellulose nitrate film. The density of background nuclei is the same throughout the depth of relatively thin stacks. Owing to this fact we succeeded in identifying the nuclei detected in outer space as excess tracks fixed in the upper sheets of the stacks.

4. Preliminary results. On the number of tracks detected with the stack No.3 the flux of nuclei with $Z \geq 6$ at an energy of 12 MeV per nucleon is estimated to be $2 \cdot 10^{-3} (\text{m}^2 \text{ s. st MeV/nucleon})^{-1}$. In this case the energy was estimated from the range-energy dependence for oxygen nuclei and the detection time was associated with the exposure time, 132 hours. The data from the stack No.1 and No.2 show that the significant part of nuclei were observed in the region of an increased proton flux, i.e. in the Brasil magnetic anomaly, but the statistical errors of these data are high.

5. Discussion. Comparing the present experimental data and the results /3/ we conclude that the flux of nuclei in September, 1984

is by a factor of about 50 less than that of in May, 1981. This difference under identical experimental conditions indicates the large time fluctuations of the flux intensity observed in the orbit. These fluctuations can explain the result /5/ that the flux of oxygen nuclei with an energy ~ 10 MeV per nucleon in the same orbit in 1978/79 years was $10^{-2} (\text{m}^2 \text{ s. st. MeV/nucleon})^{-1}$ which is 20 times as small as the value we obtained in May, 1981 at the same solar activity.

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