TSKHRA-TSKARO COMPLEX INTENDED FOR THE INVESTIGATIONS OF EAS SPATIAL CHARACTERISTICS NEAR AXIS

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Tskhra-Tskaro EAS complex located at the height of 2500 m above sea level is intended for a correlated investigation of three main components of the extended atmospheric showers (EAS) - hadron, muon and electron-proton ones - near the shower axis. This complex is aimed at the investigation of proton and primary cosmic radiation nucleus interactions with the nuclei of air atoms within the energy range $10^{14} - 10^{16}$ eV.

The complex will consist of the following basic parts (see Fig.1):

1. Shower part of the complex for the measurement of the shower electron-proton component (N°3,4,5,8).

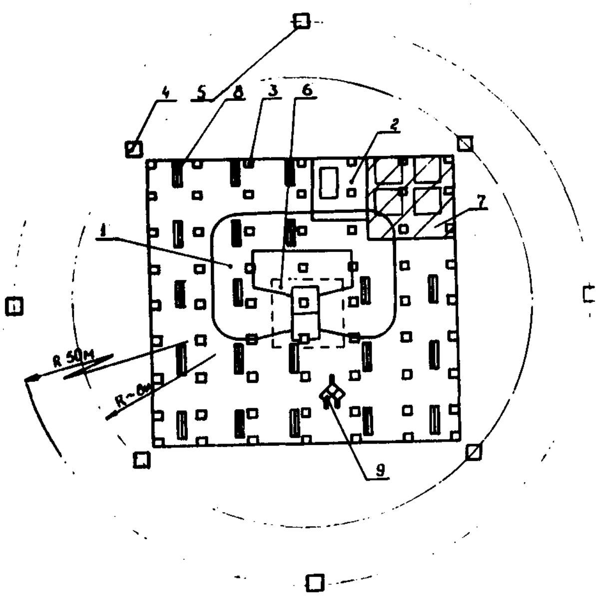

Fig.1

2. Mobile master device (N°9).
3. The installation for the investigation of hadron nuclear interactions EAS-„ЯВА" (N°1,6).
4. „Video-EAS" installation (N°2,7).
5. μ-detector installation (Fig.2, N°6).

I The shower part is an installation of central type including scintillation and ionization sensors for the measurements of the energy and direction of the particle generating an EAS, the avalanche age, the spatial behaviour of its basic components, EAS axis restoration.

The dimensions of scintillators (3 cm thick) used in the central part are 0.5 x 0.5 m² the information pick-up from the detector corner.

The scintillators are 1.5 m distant from each other, filling an area of $\sim 160\ m^2$. It is also planned to locate on this area paired ionization chambers ~ 5 m distant from each other (see Fig.1). Thus, a sufficiently detailed reproduction of the EAS central part is achieved.

The periphery of the shower part of the complex consists of two groups of scintillation detectors. One of them (4 detectors) will be situated along a circumference with a radius of 8 m centered in the geometric centre of the complex, while the second similar group of detectors will be situated at a radius of ~ 50 m with respect to the geometric centre (see Fig.1). In the peripheric scintillators, the detectors 3 cm thick with the dimensions of $1 \times 1\ m^2$ are used, with the information pick-up from the top.

II. Mobile master device represents three scintillation counters close to each other and switched for coincidence with the dimensions $0.5 \times 0.5 \times 0.5\ m^3$ (Fig.1, N°9), which will detect the atmospheric showers with the energy $E \geqslant 10^{14}$ eV and define the axis position.

Moving the singling-out system within the distance of $0 \div 15$ m from the spark chambers, one may obtain the averaged spatial distribution of EAS components by measuring the particle density in spark chambers.

III. The installation " ЯВА" has been working at the station for 10 years serving for the investigation of hadron interaction with nuclei within the energy range $0.1 \div 10$ TeV. This unit includes a magnetic spark spectrometer (MSS) and a „small" ionization calorimeter (SIC). Spark chambers (Fig.1, N°5, Fig.2, N°1,5) intervaled with targets 0.1 nuclear interaction length thick are situated in the upper part of the magnet gap. This unit serves to determine the direction of an incident charged hadron and the characteristics of secondary particles.

IY. "Video EAS" apparatus is intended for a detailed investigation of EAS characteristics near the axis, as well as correlations between them, using spark and ionization chambers. The apparatus contains a large ionization calorimeter (BIC) (Fig.2, N°3), and its depth is supposed to reach 1000 g/cm^2. At present, $\sim 200\ g/cm^2$ of the absorbent is laid, and one layer of ionization chamber with a total number of the registration channels equal to 16 is mounted.

A part of the spark chambers of the "Video EAS" apparatus is mounted under the large ionization calorimeter (Fig.2, N°4) and serves for the simultaneous observation of hadron and muon EAS components. In the course of the experiment, muon registration threshold will be increasing beginning from $E \geqslant 0.5$ GeV at the BIC thickness of 0.2 kg/cm^2. (Hadron registration threshold are approximately 50 times higher).

In the other part of spark chambers located in the immediate vicinity of BIC, the electron-photon EAS component with the energy threshold of ~ 2 MeV is registered. The upper and lower walls of the chambers are transparent, and the inner volume is photographed with the cameras.

Y. μ -detector is located under the SIC of apparatus and consists of two-spark chambers interleaved with magnetized iron (the magnetic field intensity is ~ 2 T) and scintillation starting device. The distance between the layers of chambers is ~ 145 cm. The photographing will be accomplished using the cameras RFK-5 constituting stereo-pairs, which is necessary to restore the spatial pattern and momentum measurements. The energy threshold of registration depends on μ -meson direction and varies within $3 \div 10$ GeV.

VI. At the Institute of Physics of the Academy of Sciences of the Georgian SSR, a two-level system of using microcomputer "Electronics-60" at the first level and the computer "SM-4" at the next one is developed. According to our plans, the computer "Electronics-60" will be carry out the calibration of scintillators and ionization chambers, the spectra treatment, etc., while the total complex treatment of the whole system will be carried uot by the computer SM-4.

VII. The problems, solved using the above complex.

The complex character of the device permits to study a wide range of nuclear-physical, cosmophysical and astrophysical problems.

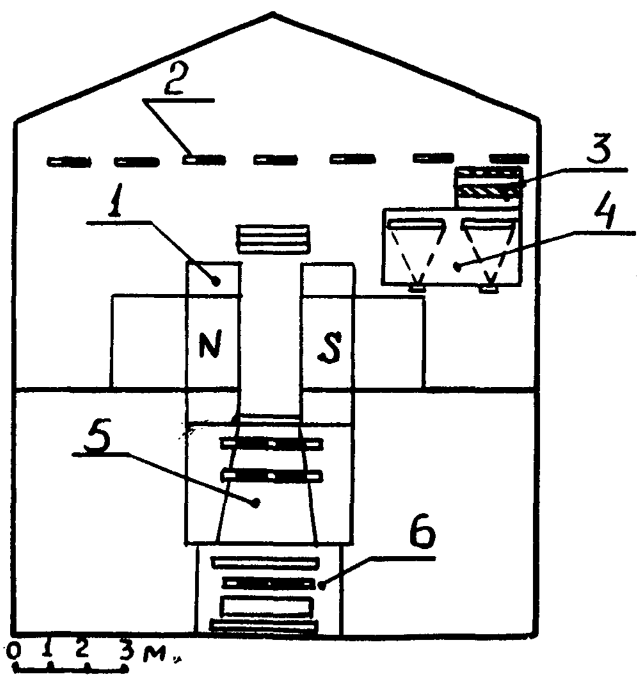

Fig.2

It is planned to study the character of transverse pulse behaviour near the axis, momentum and angular correlations between hadrons and muons and each other, to investigate the secondary particle composition (the relationships between neutron and charged components) and to study μ -meson group fluctuations in order to obtain the information on the primary composition, to study in detail the behaviour of primary particle and nuclei spectra within the energy range of $10^{14} \div 10^{16}$

Each unit of the complex described above has been tested. It is planned to put Tskhra-Tskaro installation in operation by the end of 1986.