INVESTIGATION OF GAMMA RAYS AT AN ALTITUDE OF 3340 METERS ABOVE SEA LEVEL ON A COMPLEX INSTALLATION HADRON-55

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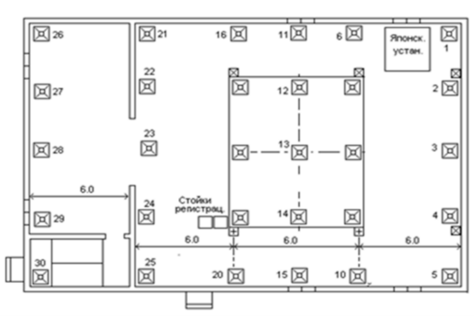
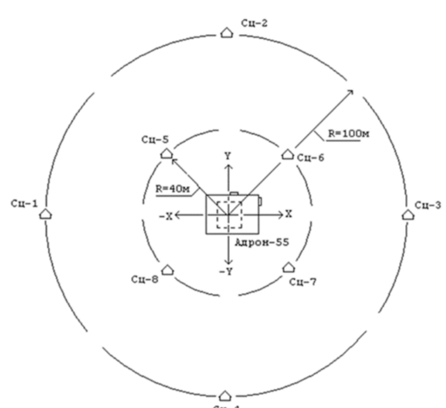
Registration of high-energy gamma rays makes it possible to locate and study catastrophic in terms of energy release, interactions in the Universe. In addition, various models, and theories of the development of the Universe are created and tested based on experimental data obtained in the field of gamma astronomy. All the above brings forward the first development of gamma-astronomical experimental research and the development of methods for their observation. The complex installation Hadron-55 is one of the detectors with a higher rejection coefficient for nuclear showers and a year-round observation time for gamma-ray sources.

At present, almost all experiments in the field of cosmic rays create or design installations for research in the field of gamma astronomy. Only gamma astronomy provides information about the coordinate and energy of events occurring in the Universe, since gamma rays consist of neutral particles and do not deviate from the influence of electromagnetic fields. This, in turn, makes it possible to determine the place and study catastrophic in terms of energy release, interactions in the Universe. In addition, various models, and theories of the development of the Universe are created and tested based on experimental data obtained in the field of gamma astronomy. All the above brings forward the first development of gamma-astronomical experimental research and the development of methods for their observation.

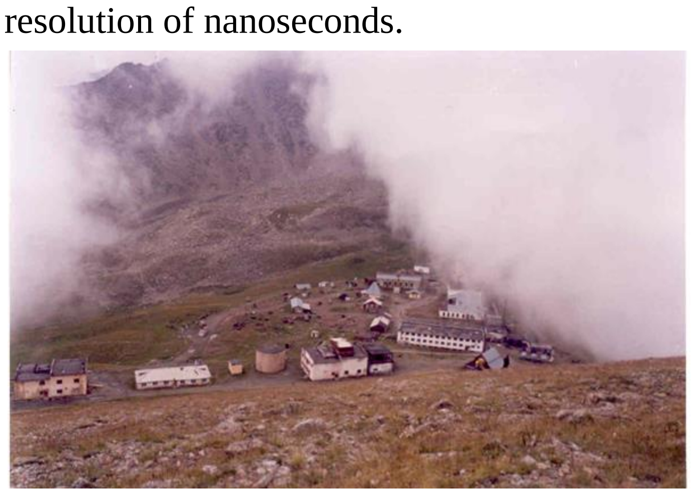
The first data on gamma radiation (> 100 MeV) were obtained in 1968 at the satellite gamma-ray telescope OSO-3 (USA). After registration of gamma rays on board the space observatory was carried out using gamma telescopes EGRET, LAT, GRID.

Hadron-55 belongs to the third type of detectors, which has a higher rejection coefficient of nuclear showers and a year-round observation time for gamma-ray sources. For these purposes, an upgraded ionization calorimeter with a field of scintillation detectors is used.



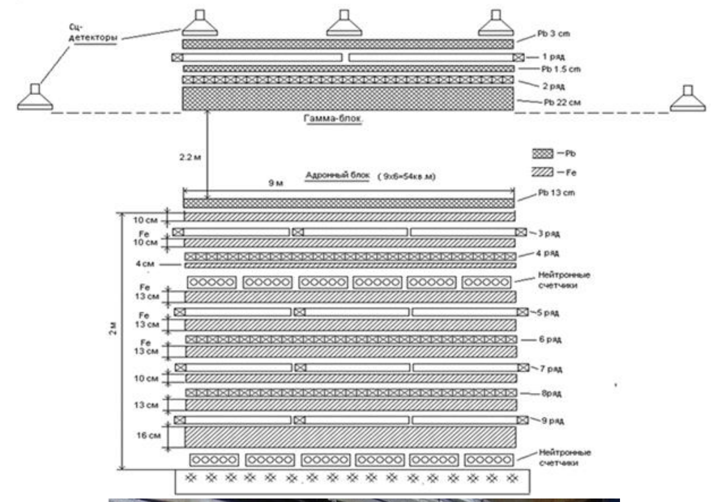


The main idea is to carry out gamma-ray astronomical studies using the method of extensive air showers, i.e., without expensive Cherenkov detectors and select events when interactions occur in the gamma block and there are no interactions in the hadron block, i.e., EPCs are selected. To reliably measure the trajectory of the primary particle, a network of scintillation detectors is used, which are equipped with apparatus with a resolution of nanoseconds.



The complex installation Hadron-55 is located at the Tien Shan high-altitude scientific station located at an altitude of 3340 meters above sea level

Hadron-55 consists of two-tier coordinate ionization calorimeters and central shower facilities with 30 scintillation detectors and 12 peripheral scintillation detectors. The area of Hadron-55 is currently 55 m2. Total thickness 1200 g / sq. Cm.



The main advantages of Hadron-55 are that

1) can work all year round, regardless of the weather and time of day.

2) due to year-round work allows to explore a wide angle of simultaneous exploration of the celestial sphere.

3) in the gamma block of the installation, the energy and geometric distributions of the EPC can be obtained, when studying the same gamma source with the accuracy of the width of the ionization chamber.

4) a huge amount of recorded data can be adjusted electronically by changing the registration thresholds.

In the first part of the research work, a literature review on the methods of registration, data processing and a description of the advantages of the complex Hadron-55 installation was carried out.

In the second part, the software "Hadron" is used for the analysis and selection of events by histograms of amplitudes of signals from ionization chambers and scintillators of experimental data from the zero-bank obtained at the Hadron-55 facility.

Data processing boils down to combining and establishing a correspondence between mutually perpendicular rows of each unit of the installation. The reference was made to the previously established coordinate system of each detector, with the reference point O (0,0) in the center of the row. The unification and establishment of the correspondence of mutually perpendicular rows was carried out depending on the structure of the arrangement of the detectors of each row. The result of the executed part of the program generates arrays of combined and normalized data for each layer of the ADRON-55 setup for further analysis of multiparticle geometric fluctuations.