

Detector for the ultrahigh energy cosmic rays composition study in Antarctica

Tuesday, 11 October 2016 16:15 (15)

The main aim of the Sphere-Antarctic project is connected to the fundamental problems of the cosmic ray (CR) physics and general astrophysics — the determination of the energy and mass composition of cosmic ray particles of ultra high and extremely high energies $10^{18} - 10^{20}$ eV. In the energy region above $6 \cdot 10^{19}$ eV modern experiments (Telescope Array and Pierre Auger Observatory) observed anisotropy and the clustering of arrival directions of cosmic rays in some areas. The scientific importance of this problem stems from the lack of generally accepted acceleration mechanism of the CR particles above $3 \cdot 10^{18}$ eV, the unknown nature of the sources of such particles, the inconsistencies of the results of major experiments in the part of the mass of CR composition and the discrepancy of experimental and model data. Scientific novelty of this project is in the methodology registration of the extensive air showers over a large area ~ 600 km² from altitude 30 km, that allows to measure the two optical components of the shower Vavilov-Cherenkov radiation and fluorescence light by the same SiPM sensitive elements of the detector simultaneously.

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Session Classification : Methods of experimental physics - parallel II

Track Classification : Methods of experimental physics