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Cherenkov water calorimeter on the basis of quasispherical modules

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Cherenkov water detector (CWD) with the volume of 2000 m3 (a pool with the dimensions of 26 m x 9 m x 9 m) is the basis of the NEVOD experimental complex which is designed for studying of various cosmic ray components, including muons generated by the neutrinos from the lower hemisphere. Inside the pool the detecting system in form of a spatial lattice of quasi-spherical modules (QSMs) is located. Each QSM consists of six FEU-200 flat-photocathode photomultipliers (15 cm diameter) oriented along the axes of orthogonal coordinate system. Such arrangement of photomultipliers makes the QSM amplitude response independent of the arrival direction of the Cherenkov radiation from relativistic charged particles passing through the detector. At the same time, analysis of the amplitude responses of even a single QSM's photomultipliers allows to determine the arrival direction of Cherenkov radiation, and the QSM spatial lattice enables reconstruction of the individual particle tracks. To register powerful energy deposits inside the detector, the two-dynode PMT signal readout system providing a total dynamic range of the measuring channel 1 - 10^5 ph.e. was developed. Small distances between the QSMs and a wide dynamic range ensure the detector with the properties of a calorimeter for measuring of the energy deposit of muon bundles and cascade showers generated by the near-horizontal muons. For the calibration of the PMTs, the events with single muons are used. Such events are selected using the system of calibration telescopes (SCT) and the coordinate detector DECOR deployed around the pool.

Collaboration

– not specified –

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