



Contribution ID: 100

Type: oral

New detectors of the Experimental complex NEVOD for multi-component EAS detection

Tuesday, 6 September 2016 11:45 (15 minutes)

Experimental complex NEVOD is located at MEPHI campus (Moscow) and is the only in the world that allows to conduct a fundamental (astroparticle physics) and an applied (monitoring and forecasting the state of near-terrestrial space) research with the use of cosmic rays on the surface of the Earth over the entire range of zenith angles (from 0 to 180 degrees) in a record energy range ($1 - 10^{10}$ GeV). The complex NEVOD includes the number of unique facilities for detection of cosmic rays at ground level: the large volume Cherenkov water detector (CWD) (2000 m^3) with a spatial lattice of quasi-spherical modules (QSM); the vertically deployed around CWD coordinate-tracking detector DECOR (total setup area 70 m^2) with a high spatial and angular resolution for the detection of particles at large zenith angles up to horizon; the muon hodoscope URAGAN with the total setup area 46 m^2 continuously registering muon flux in the range of zenith angles from 0 to 80 degrees; the system of calibration telescopes (SCT) that allows to calibrate the response of QSMs and record the electromagnetic and muon components of EAS; a prototype detector for the measurements of atmospheric neutrons PRISMA-32.

At present, to provide multi-component registration of EAS, new detectors are being developed around the complex. Along with traditional components, such as electron-photon and muon, the simultaneous detection of EAS neutron component and local muon density spectra will be conducted. An important feature of the complex is the possibility of detecting of muon bundles energy deposit by means of the NEVOD Cherenkov water calorimeter.

For detection of EAS in the energy range $10^{15} - 10^{17}$ eV by means of a traditional technique, the NEVOD-EAS array of scintillation detectors will be installed around the NEVOD. NEVOD-EAS has a clustered structure of detection system formation and consists of scintillation counters earlier used in EAS-TOP and KASCADE-Grande facilities.

The array for detection of EAS neutron component URAN is now under construction in MEPHI in collaboration with INR RAS. The basic detector for the URAN setup is en-detector sensitive to both thermal neutrons and electromagnetic components. En-detector is based on a thin layer of alloyed mixture of inorganic scintillator ZnS(Ag) with B_2O_3 as a target for neutrons.

Another facility aimed to sufficiently improve an ability of the coordinate-tracking detector and to solve a problem called 'muon puzzle' is the detector TREK designed for a joint operation with Cherenkov water detector NEVOD and based on the drift chambers from the neutrino experiment at the IHEP accelerator U-70 (Protvino). Detector TREK is a large-scale installation and consists of two X- and Y-oriented drift chamber vertical planes, mounted on the outer wall of the Cherenkov water detector building. The effective area of the detector will be about 270 m^2 . The new detector will exceed the currently operating coordinate detector DECOR in the effective area by 3.5 times and in the separation of muon tracks in groups by 10 times.

These new detectors together with the existing facilities of the NEVOD complex will provide never early used experimental abilities and give a unique possibility to carry out the study of EAS characteristics at a new experimental level.

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Session Classification: Parallel