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The project of the hardware and software system for storage and analysis of large amounts of data of the scientific facilities of the Experimental Complex NEVOD

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To date, cosmic rays are the only tool that allows one to study nucleus-nucleus interactions at energies of hundreds of TeV in the center-of-mass system. Investigations of high-energy CR are carried out by detection of secondary particles of extensive air showers (EAS) formed in interactions of primary particles with the Earth's atmosphere.

Earlier studies of EAS revealed a number of unusual phenomena in the interactions of particles of high and ultra-high energies: in the measured energy spectrum of cosmic rays a number of features that today cannot be explained within the framework of a single model are observed. The key to explaining these phenomena may be the results of multicomponent studies of EAS carried out in frames of the complementary approach to the experimental data analysis.

Such studies and such an approach can be implemented at the Experimental Complex (EC) NEVOD. The complex combines six scientific facilities (NEVOD, DECOR, CTS, NEVOD-EAS, PRISMA-32 and URAN) which are launched in operation and allow one to study the same events using three components at once: electron-photon, muon and hadronic ones.

As a result of the operation of the facilities, a volumetric data stream is formed. It contains topological, trigger, coordinate, amplitude and time information about recorded events. At the same time, to solve various computational problems in order to verify the obtained experimental results and develop new methods, an impressive bank of simulated EAS and facility responses obtained using the Geant4 and CORSIKA software packages is required.

Therefore, for storing and efficient analysis of experimental and simulated events of the facilities of the Complex, a hardware and software system for storage and analysis of large amounts of data is being created. This system will be deployed on the basis of the EC NEVOD data processing center providing all the necessary operating conditions, including a backup power system, and integration into the EC NEVOD local area network. Modern DBMS will make it possible to effectively select from the total amount of events (both experimental and simulated) only those ones that satisfy certain criteria and are suitable for solving specific physical problems.

In the report, we describe the hardware and software architecture, features of the system for storage and analysis of large amounts of data of the scientific facilities of the Experimental Complex NEVOD. We also present the structures of the databases for storing data of experimental events which are already implemented and used for analysis. The prospects of the further development of the system are discussed.

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