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Status of the scintillation experiment of the TAIGA astrophysical complex

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In 2019, as part of the development of the TAIGA (Tunka Advanced Instrument for cosmic rays and Gamma Astronomy) astrophysical complex, construction of the TAIGA-Muon scintillation facility began in addition to the existing Tunka-Grande system. The main objective of these systems is to study the energy spectrum and mass composition of cosmic rays in the energy range of 10^{15}–10^{18} eV, as well as to search for gamma radiation in the same energy range. Original detectors have been developed for the TAIGA-Muon facility that use light guides with spectrum re-emitters to collect light on the PMT. Currently, 5 out of 10 planned stations (clusters) have been deployed. Each station contains a ground part for detection of the charged component of the EAS and an underground part for the muon component registration. The report, firstly, presents the objectives and status of the facility, a description of the design of scintillation counters and clusters, as well as the structure of data collection, time synchronization, control and monitoring systems. The results of the study of EAS with an unusual spatiotemporal structure are presented. It is assumed that the nature of the pulses with a multipeak structure and multipulse signals observed in the Tunka-Grande detectors is associated with random coincidences from single atmospheric muons, PMT afterpulses, and features of the spatiotemporal structure of the EAS. The report also presents the results of a study of the joint operation of the Tunka-Grande and TAIGA-HiSCORE setups in order to search for sub-PeV gamma quanta. Estimates are made of the expected number of registered gamma quanta from the Crab Nebula. The work was supported by the Russian Science Foundation, project 23-72-00054.

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