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Status of the early construction phase of the BAIKAL-GVD

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The second-stage neutrino telescope BAIKAL-GVD in Lake Baikal will be a research infrastructure aimed mainly at studying astrophysical neutrino fluxes by recording the Cherenkov radiation of the secondary muons and showers generated in neutrino interactions. The design for the BAIKAL-GVD neutrino telescope is an array of photomultiplier tubes each enclosed in a transparent pressure sphere to comprise an optical module (OM). The OMs are arranged on vertical load-carrying cables to form strings. The final configuration of telescope will consist of 27 clusters of strings – functionally independent subarrays, which are connected to shore by individual electro-optical cables. Muon effective area rises from 0.3 km² at 1 TeV to about 1.8 km² asymptotically and shower effective volumes are about 0.4–2.4 km³ above 10 TeV. During the R&D phase of the GVD project in 2008–2010 years the basic elements of GVD – new optical modules, FADC readout units, underwater communications and trigger systems – have been developed, produced and tested in situ by long-term operating prototype strings in Lake Baikal. The prototyping/early construction phase of the BAIKAL-GVD project which aims at deployment and operation of the first Demonstration Cluster has been started in April 2011 with the deployment of a three string engineering array which comprises all basic elements and systems of the GVD in Lake Baikal and was connected to shore by electro-optical cable. Demonstration Cluster will comprise eight 345 m long strings of optical modules – seven peripheral strings are uniformly arranged at a 60 m distance around a central one. Each string comprises 24 OMs spaced by 15 m at depths of 950–1300 m below the surface. OMs on each string are combined in two sections – detection units of telescope. Also the Demonstration Cluster will comprise an acoustic positioning system and an instrumentation string with equipment for array calibration and monitoring of environment parameters. An important step on realization of the GVD project was made in 2013 by the deployment of the first stage of Demonstration Cluster which contains 72 OMs arranged on three 345 m long full-scale strings, as well as equipment of an acoustic positioning system and instrumentation string with an array calibration and environment monitoring equipment. This configuration has been upgraded to 5 string array in 2014. Deployment of the Demonstration Cluster will be completed in 2015.

The review of the design and status of the demonstration cluster construction will be presented.

Summary

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