Report on the project

"Deep underwater muon and neutrino detector on Lake Baikal (Gigaton Volume Detector)"

It is my pleasure to present my opinion on this great project. During the last three years, Baikal-GVD became a reality since 2 of 8 planned clusters are now taking data. Deployment and commissioning of the telescope follows closely the plan previewed. The instrument became the second largest in the world and the largest in the Northern hemisphere. This is a real success of the Baikal proposal, and I appreciate the amount of work done and the level of qualification involved.

Since 2014, scientific motivation for the Baikal experiment has strengthened considerably. Indeed, despite numerous efforts by a large number of scientists in the world (including myself), a consistent explanation of the origin of high-energy events observed by the IceCube experiment at the South Pole in terms of a population of their astrophysical sources is missing. Combination of neutrino data with those from cosmic-ray and gamma-ray astronomy kills most of the proposed models. This may point either to new exciting (astro)physics or to considerable systematic errors or biases in the IceCube results. Both possibilities encourage us to build a new competing high-energy neutrino detector with large effective volume, good angular resolution and different systematics. Since the European KM3Net project is developing slowly, the Baikal GVD experiment provides for a unique opportunity to resolve the puzzle.

A few comments on the progress report are in order.

1. While the hardware part is progressing perfectly, there is a strong need in the development of a good Monte-Carlo model of the experiment. As it is demonstrated in Fig. 1 of the report, presently the model gives a poor description of the reconstructed atmospheric muon flux. Since data are being taken with a large-volume detector already, the development of the Monte-Carlo model is a very urgent need.

2. For the working unique experiment, it is very important to become a part of the worldwide cooperative programs in multimessenger astronomy, in particular by participation in various alert systems allowing for a better study of transient events.

In my opinion, these comments may be taken into account in the future work of the group. I think that continuation of full support of the GVD experiment is, no doubt, of crucial importance for today's astroparticle physics.

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