Referee report on project **DANSS –**
Detector of the reactor AntiNeutrino based on Solid state plastic Scintillator,
proposed for prolongation in 2019–2021

Investigations of the genuine neutrino properties are within the main tasks of modern particle physics. The neutrino oscillations, tritium beta-decay and nuclear neutrinoless double beta decay experiments allow one to fix parameters of neutrino mixings, determine the absolute scale of the neutrino mass pattern as well as to reveal the Nature of the neutrinos (are they Mojorana or Dirac particles).

On the way to reveal above-mentioned properties of neutrinos permanent study of reactor antineutrino fluxes looks very promising scientifically. What is highly important in such a case that this scientific study puts on a regular and very accurate background any remote on-line diagnostics of nuclear reactor parameters (the task which could not be overestimated today). To realize both these problems (scientific and practical) one needs a new (anti)neutrino detector to register reactor antineutrinos and to measure their flux and energy spectrum with a good accuracy.

The common JINR–ITEP project DANSS had a goal of development, construction and exploration of such a detector – detector of the reactor antineutrinos based on solid plastic scintillator, aimed first of all at the real time monitoring of the reactor parameters. Such monitoring is very actual not only for fundamental physics experiments (neutrino magnetic moment, oscillations, θ_{13}, etc.), but also for safeguards application (nonproliferation), as well as possible neutrino tomography of the reactor.

The detector DANSS includes $1m^3$ sensitive part consisting of 2500 independent detector cells made of polystyrene-based scintillator. Contrary to liquid scintillators, the solid one has quite stable parameters and is fire-safe, which removes the restrictions on its application at an industrial nuclear power plant. As I know, today the DANSS detector is the only one which is allowed to operate at low distance from the industrial power reactor. More simple and small version of the detector (S-cube) seems to be even more suitable for such application.

Being movable, the detector can register any evolution of the neutrino spectrum with distance, which could be caused by hypothetical short-range oscillation of the neutrino to a sterile state. Investigation of this phenomenon should be performed as the first-priority job. More than one year of the DANSS operation have revealed most of technical defects and imperfections, so that today data acquisition is quite stable. The authors must realize their chance and collect enough data to confirm or disprove the "reactor anomaly" asap.

As about the next development of S-cube and especially participation in the NEUTRINO4-NEOS collaboration – I expect that this part of the project will be successful as well. The team of the project has huge experience in high-precision nuclear spectroscopy and low-background measurements with semiconductor and scintillator detectors. There are facilities and experts in production and operation of different types of semiconductor and scintillator detectors. As I know, the participation and contribution of this Dubna group is eagerly welcomed in any international project in the field of neutrino. Of-course, the background conditions at the research reactor differ from the KNPP, but combined efforts of all three groups (being the most advanced in this field) allows to expect the right solution of the problem.

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