Review of the DANSS project

(Detector of the reactor antineutrino based on solid state plastic scintillators) proposed for extension to 2022-2024 under the JINR research theme 03-2-1100 2010/2024 "None accelerator neutrino physics and astrophysics"

The project uses the spectrometer on a gadolinium-coated plastic scintillator to measure antineutrinos from an industrial reactor. Antineutrinos are detected using inverse beta decay, whose signature allows filter out perfectly background events. The high segmentation of the detector also allows good reduction and precise measurement of all background components.

Due to the fact that the detector does not contain hazardous materials, it is located close to the industrial reactor of the Kalinin NPP and is installed on a mobile platform that allows measurements at a record distance of 10-12 m from the center of the reactor core with a record rate of about 5000 antineutrinos per day.

During the project from 2016 to 2020, the detector collected the world's largest statistics of reactor antineutrinos - 4M events, demonstrated reliable operation, the ability to monitor the reactor power with good accuracy, as well as sensitivity to the composition of nuclear fuel.

The results of the analysis of the ratio of the antineutrino spectra collected in different positions did not show a significant signal from oscillations to the sterile neutrino, which made it possible to exclude a significant part (more than competing projects) of the phase space of the 3 + 1 model.

At the same time, in the current configuration, due to the low resolution, the DANSS spectrometer is unable to test large-mass oscillation regions ($\Delta m_{14}^2 > 5$ eV^2). Just where, according to the results of our NEUTRINO-4 experiment, an oscillatory signal is observed ($\sin2(2\theta_{14})$~0.2-0.3, Δm_{14}^2~6-7 eV^2)! In order to get closer to this area, the Collaboration are making ambitious efforts to significantly increase the resolution in the upgraded DANSS-2 spectrometer.

The project has a detailed work plan, the implementation of which is beyond doubt. In our opinion, independent verification of the NEUTRINO-4 result is important for neutrino physics in particular and fundamental science in general. Therefore, I believe that this project should be extended and its execution should be supported with a high degree of priority.

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26.10.20