

Review of the project

Short Baseline Reactor Neutrino Studies

The project under discussion, "Short Baseline Reactor Neutrino Studies," focuses on experiments performed at short (order of a few meters) distances from the antineutrino source, which in the case of the DANSS and ν GeN experiments is a nuclear power reactor, and in the RICOCHET experiment – a research nuclear reactor. At the same time, the experiments are united by the similarity of the approaches, methods, and nuclear reactions used to register antineutrinos, as well as the personnel involved in the considering work. The relevance of projects of this kind seems undeniable - research in neutrino physics is still cutting edge and one of the most discussed topics in particle physics. Despite the strong influence of neutrinos on the evolution and existence of the universe, many of their properties, such as mass, nature (Majorana or Dirac), electromagnetic moments are still not measured.

As part of the discussing experimental program, it is intended to study the processes of coherent neutrino scattering, the question of existence of neutrino oscillations to the sterile state (in the model with one sterile and three active neutrinos), and the possibility of existence of an anomalous magnetic moment of neutrino, in addition to the one predicted by the minimally extended Standard Model (MSM). The first of these processes is not forbidden by the Standard Model, but due to the tiny energy transferred by neutrinos it still not yet has reliably confirmed registration. In the case of detection of the phenomenon of coherent scattering it may become possible to create quite compact neutrino detectors based on it, as opposed to the existing often cumbersome facilities. The question of the existence of the sterile neutrino is widely discussed after the discovery of the alleged deficit of reactor antineutrinos (reactor antineutrino anomaly). The confirmation of RAA by NEUTRINO-4 and BEST experiments is in some contradiction with each other and earlier results, so additional verification seems necessary. As for the anomalous magnetic moment of the antineutrino, its existence within the minimally extended standard model would imply the Majorana nature of neutrinos, a fact not yet established by experimental physics.

The proposed project is based on the group's previous experience with similar facilities. For instance, the DANSS-2 facility is the basis for the DANSS-2, which has produced some of the world's best constraints on sterile neutrinos, including those that "close" the initially proposed parameters. The ideas of GEMMA experiment is used in the ν GeN installation, and the experience gained by the EDELWEISS research team is invaluable for the RICOCHET facility.

The project is valuable not only experimentally but also theoretically. The study of neutrino fluxes from reactors can improve theoretical models of reactor

processes: the number of neutrinos per fission, the influence of fuel composition on the neutrino energy spectrum. It is important to note the applied aim of the project - improving the quality of reactor monitoring. At the same time, it should be noted that there is a high competition in the field of research of reactor antineutrinos at short distances, so meeting the project deadlines and keeping the schedule of project funding is especially important.

In general, there is no doubt about the importance and scientific relevance of the project - "Research reactor neutrinos at short range", and the experimental group has all the skills and competence, as well as many years of experience in similar projects, which allows to recommend the implementation of the declared experimental program.

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