Review of the project

“Fundamental and applied physics using beams of relativistic accelerated electrons”

The considered work represents a logical development of the research in the field of interaction of relativistic beams with electromagnetic fields and materials at the linear accelerator LINAC 200 in the framework of the international program FLAP (Fundamental and applied Linear Accelerator Physics Collaboration). The main directions of research are related to both theoretical and experimental studies in the following fields: generation of high power broad-band THz radiation; diagnostics of pulses of charged particles with femotosecond resolution; development of new concepts of particle acceleration, including wakefields; development of conventional technologies and methods for particle acceleration; study of relativistic charged particle – matter interaction. This project is also aimed at collaboration with other international initiatives in such fields of physics as high energy physics, cosmology, and accelerator physics. Collaborative contacts will be based on mutually beneficial studies towards the development of new detectors and monitors for high energy particles. It should be noted that it is proposed in the project to involve young scientists to solution of all formulated tasks at all stages, which makes this project especially attractive.

The topical character of the project lies in its aims. It is planned to develop new sources of high power THz radiation with characteristics ensuring unique experiments in biology, chemistry, and material research, based on LINAC 200; develop and calibrate detectors of the new generation for accelerator and high energy physics; develop sources of neutron and electromagnetic radiation. It is obvious that the solution of these tasks will contribute to the development of both fundamental science and applied research. The latter is especially important for development of advanced technologies in the field of new composite materials and electronics. This project presents unique possibilities of research and education at the same time. There exist relatively few installations of this class, the most well known machines are CLEAR (CERN, EU), CLARA (STFC UKRI, DL), LUCX (КЕК, Japan), FEL-IC (Havaii University, USA). All these installations are remarkable for the possibility to both perform studies in various fields of science and participate in the educational process of the new generation of physicists in accelerator physics and adjacent fields, where accelerators are required. Usually, accelerators are unavailable for research initiated by students and young scientists. This project allows one to develop both direction, presenting a ground for young researchers.

The main effort in the project will be concentrated on development of new high power THz sources of coherent radiation, new noninvasive beam diagnostic methods with femtosecond radiation, development of new detectors, their testing and calibration for international experiments, such as NICA, radiobiological studies, research and development of new pulsed neutron sources, experiments in the field of fundamental particle physics. The set of planned experiments and their aims are broad and ambitious, and due to smart involvement of competent scientists, realistic. The international team of the project possesses multiply proven vast expertise and knowledge. Each project leader has its team with the background for organization of the stated research. The estimated funding is adequate to the formulated tasks and obligations undertaken by the authors. From my point of view, this project has an innovation and ambitious character from the scientific point of view, balanced and thoroughly worked through from the point of view of personnel selection and financing, and should be approved.



06.04 2023 Professor I.V. Konoplev