

Linear electron accelerator LINAC-200 as a core for a new test beam facility at DLNP JINR

Preparation of experiments at future accelerators requires the creation of detectors capable of handling large intensity and ensuring the required accuracy and reliability of particle registration. The development of new detectors is also important for applied research based on the use of synchrotron radiation sources and intense X-ray facilities. In particular, the creation of new synchrotron radiation sources in the Russian Federation necessitates the development of experimental stations based on detectors with high spatial and energy resolution. The ability to test detector prototypes on test beams plays a key role in achieving progress in the creation of new types of electromagnetic calorimeters and coordinate detectors for the MPD and SPD experiments at the NICA collider at JINR, photon imaging detectors, radiation-hardened detectors and dosimetric devices.

A new facility in the Laboratory of Nuclear Problems, the LINAC-200 linear electron accelerator (the first stage of the LINAC-800 facility), is being prepared for commissioning and start-up in 2025. The facility is based on the reconstructed MEA accelerator transferred to JINR from the National Institute for Subatomic Physics (NIKHEF, the Netherlands). The key subsystems of the accelerator were redesigned or extensively modernized. The project to create a test area for research on LINAC-200 is actively developing. It is possible to conduct research on test electron beams with energies in the range of 5–200 MeV, pulsed current from units of electrons in a bunch to 80 mA, and a maximum average current of 5 μ A. The main tasks of the accelerator are related to providing electron beams to:

- scientific and methodological work on the creation of elementary particle detectors at DLNP, VBLHEP and in scientific centers of JINR member states to support experiments at the NICA collider and external experiments;
- scientific and methodological work on the search for new methods and the creation of equipment for electron beam diagnostics;
- applied work in the field of radiation materials science, radiochemistry and radiobiology (LRB);
- conducting experiments in the field of nuclear physics (including the study of photonuclear reactions - a joint project of DLNP with colleagues from Vietnam under the leadership of Professor Le Hong Khiem);
- educational projects (jointly with the JINR UC).

The high attractiveness of this facility for scientific teams both in Russia and in other countries led to the creation of a new scientific collaboration FLAP (Collaboration on Fundamental and Applied Physics on Linear Accelerators). The FLAP collaboration is aimed at studying the subtle effects of electromagnetic interactions with matter and new applications of controlled generation of electromagnetic radiation by relativistic electrons using functional materials. The FLAP collaboration program has been approved by the JINR PAC for Particle Physics.

In 2024, the creation of new accelerator interlock and signaling system and ASRC (automated radiation monitoring system) systems was completed, beam absorbers were designed and installed in the accelerator hall. The documentation required for commissioning of this facility is being completed.

The report will provide an overview of the main systems and the current status of the LINAC-200 accelerator, as well as beam characteristics on the existing user channels.