THE PRACTICE OF ELECTRON AND PROTON ACCELERATORS UTILIZING FOR INDUSTRY, EDUCATION AND SCIENCE

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Since 2015 in Ural Federal University the linear electron beam accelerator is functioning for the purposes of radiation sterilization and modification materials, scientific researchers and education. On the base of accelerator, the Radiation Sterilization Center (RSC) was organized with main industry activity in a field of medical devise sterilization. On the present day five main customers are realized procedure of radiation sterilization of single used medical clothes, surgery sets, blood test tubes and other goods at RSC. After six years of activity in this field we can define some critical points for successful operation of facility for radiation technology and where our efforts were made. Regular maintenance and modernization of all installation's modules (vacuum, high voltage equipment, ventilation, conveyor system and others) needed to be done for reliability providing. Quality management system according to standards of technology should be organized for documenting of radiation sterilization procedure. Dose measurement should be traceable for primary standards of absorbed doses. Regular work with customers for the explaining of radiation sterilization procedure validation should be carried out. In principle that is well known steps but in the specific of countries and used facilities can be realized in different ways.

The scientific and education activities are realized in parallel with industrial work. The construction of RSC allows to irradiate different materials by electrons directly under the beam and with step-by-step accumulation of absorbed dose with using of a conveyor. Moreover, irradiation could be done simultaneously with the main process of radiation sterilization. So, scientific research includes studying in areas of radiation physics, chemistry, biology and focused on condensed matter and biological objects properties changing investigation under the action of E-beam in different modes, determining of velocity and time characteristics of surface and volume modifications. Through the water-cooling system, it is possible irradiate samples without essential increasing of its temperature under the direct electron beam.

Education process at E-beam accelerator realized in two ways. The first one is work with students of bachelor and muster programs. RSC facility is included in regular laboratory works in nuclear physics, applied nuclear physics, Metrology of ionizing radiation, nuclear physics installations and other courses, used for preparation of student's diploma and scientific research works. The second way is training courses performing. From the 2015 RSC took active part in regional projects of IAEA Technical cooperation projects area of non-power radiation technologies implementation. From 2017 E-beam accelerator with equipment for radiation sterilization became a place for IAEA Regional training courses in a topic of dosimetry measurements. Two courses were carried out in 2017 and 2019, next one is planned in 2023. Besides facility takes part in regular IAEA intercomparison program that allow to estimate the quality of absorbed dose measurements on international level. From 2019 additional training program "Multipurpose irradiation centre as a component in Centre of nuclear science and technologies" started at RSC under Rosatom corporation support. The second one courses will be held in October 2021. The program of courses includes questions of dosimetry basics, measurements of absorbed and equivalent doses and practice on RSC facility.

The latest activity concern with commissioning of TR-24 cyclotron for the purposes of F-18 and FDG production for supplies to PET centers of Ural region. The same way, as for E-beam accelerator, cyclotron is planned for scientific research, education and training courses realizing. At the present time documentation for GMP – standard providing is actively prepared.