10 DEPARTMENT OF ACCELERATOR PHYSICS AND TECHNOLOGY

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Overview

As presented at the overview seminar held on December 98, the activities of the Department were shared among several directions of accelerator applications, as well as research and development works on new accelerator techniques and technologies.

In the group of proton and ion accelerators, two main tasks were advanced. The first was a further step in the optimization of operational parameters of multicusp ion-source, prepared for axial injection system in C-30 cyclotron. Another one is the participation in important modifications of r.f. acceleration system in heavy-ion accelerator C-200 of Warsaw University.

In the broad field of electron accelerators our main attention was directed at medical applications. Most important of them was the designing and construction of a full scale technological model of a high-gradient accelerating structure for low-energy radiotherapy unit CO-LINE 1000. Microwave measurements, and tuning were accomplished, and the technical documentation for construction of radiation unit completed. This work was supported by the State Committee for Scientific Research.

Preparatory work was continued to undertake in the year 1999 the design of two new medical accelerators. First is a new generation radiotherapy unit, with 15 MeV electron beam and two selected energies of X-ray photons. This accelerator should in future replace the existing Neptun 10 MeV units. The work will be executed in the frame of the Project-Ordered commissioned by the State Committee for Scientific Research.

The next type of accelerators in preparation is the mobile, self-shielded electron-beam unit for interoperative irradiation. The specification of parameters was completed and study of possible solutions advanced.

The programme of medical accelerator development is critically dependent on the existence of ametrological and experimental basis. Therefore the building of a former proton linear accelerator was adopted to the new function as electron accelerators' laboratory . Additional radiation shielding was constructed and the computer assisted system for dosimetric monitoring was installed.

Three experimental set-ups for electron and photon beam diagnostics are in course of installation and running -at: 4-5 MeV, 10-15 MeV, and 20 MeV. The 20 MeV unit will also be used for generation and metrology of narrow photon beams applicable in stereotactic radiosurgery.

Preliminary design works are advanced, oriented, undertaken on an important project – high-power electron accelerators for radiation technology (10 MeV, 20-50 kW). Financial support for this task is still pending.

A substantial part of the Department's activity was oriented to an international collaboration with accelerator physics centres. Two works completed in 1997 were extended in 1998: microwave pulsed generator destined for short beam bunches diagnostics was installed and put in operation at INFN-Frascati ; 27 pieces of polarized "door-knob" r.f. couplers for superconducting cavities in HERA ring were installed and put in operation. In the course of 1998 we got the message from DESY, that couplers are working well and brought desirable improvement in operation reliability.

The new item of collaboration with DESY, is design, construction and r.f. measurements of a copper model of accelerating "superstructure" for TESLA collider. If successful, the use of niobium "superstructure" can shorten by about a few kilometres the length of theTESLA linear accelerator. First four 1 m sections of model structures were sent to DESY at the end of 1998. The next four are in preparation.

Some results of work done in 1998 were presented at conferences in Caen, Stockholm and Cracow.