

Use of Accelerators in Medicine

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In this thesis the use of accelerators in medicine is considered. Accelerators are used both for diagnostic procedures and in therapy. For diagnostic procedures, artificial radionuclides are used, the synthesis of which is carried out using 10-30 MeV energy proton accelerators. In this energy range, proton acceleration is most effectively achieved using cyclotrons. The thesis discusses the principle of the cyclotron, presents the construction of modern cyclotrons, and their distribution by country.

In therapy, accelerators are mainly used in cancer treatment. Currently, radiotherapy uses photon beams in the keV-MeV energy range. With modern technologies, such beams are obtained using linear electron accelerators. Recently, proton therapy, which uses 70-250 MeV energy proton beams, has become increasingly popular. The propagation of a proton beam in matter is characterized by the Bragg peak, which allows irradiation of the tumor with the maximum dose while minimizing damage to healthy tissue. Proton beams of this energy can be obtained with a modified cyclotron or a synchrotron. The thesis discusses both types of accelerators and their characteristics.