

Novosibirsk Neutron Source for BNCT

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At present, Boron Neutron Capture Therapy (BNCT) is considered to be a promising method for the treatment of tumors. The report presents the basics of BNCT, its development stages, the state of development of accelerator neutron sources for BNCT clinics and describes in detail the Novosibirsk accelerator neutron source. This source is a state-of-the-art device comprised of i) the Vacuum Insulation Tandem Accelerator (VITA) - a new type of charged particle accelerator, ii) an advanced solid lithium target with superior resistance to blistering, and iii) a neutron Beam Shaping Assembly. At VITA characterized by a high acceleration rate of charged particles a stationary proton beam with an energy of 2.3 MeV and a current of 9 mA, sufficient for therapy, was obtained. A neutron-producing target optimal for forming an epithermal neutron flux that meets the requirements of BNCT has been developed and experimentally studied. To confirm the required quality of the neutron beam, the effect of neutron radiation on cell cultures and laboratory animals was studied. In the near future, it is planned to prepare a “handmade” Novosibirsk source for conducting therapy and to implement BNCT in 2022. The Novosibirsk source became the prototype source being built for the clinic in Xiamen (China) - one of the first five BNCT clinics. In addition to being used in BNCT, the source was used to determine dangerous impurities in ceramics for ITER and is planned to be used for radiation testing of the optical fiber and photomultiplier for CERN. In the latter case, the hydrogen beam will be replaced by a deuterium one. The report gives the construction of the source, presents the results of the research and declares the plans.

Collaboration

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