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Book of Abstracts

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MODELING OF THE EPITHERMAL NEUTRONS TRANSPORT TO DEVELOP BORON NEUTRON CAPTURE THERAPY

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Currently, Boron Neutron Capture Therapy (BNCT) is considered as a promising technique for treatment of malignant tumors [1]. It provides selective destruction of tumor cells by prior accumulation inside them a stable boron-10 isotope and subsequent irradiation with epithermal neutrons. Because of the absorption of a neutron by boron, a nuclear reaction takes place with a large release of energy in the cell, leading to its death. Clinical trials on nuclear reactors showed that BNCT could treat the many types of tumors. For the widespread introduction of this technique in practice, compact sources of epithermal neutrons based on charged particle accelerators are required. A source of epithermal neutrons based on the tandem accelerator with vacuum insulation and the lithium neutron producing target is created [2] and BNCT laboratory for preparation for the therapy is formed.

Beam Shaping Assembly (BSA) consisting of a moderator, reflector and absorber is used for therapeutic neutron beam forming. The report describes BSA optimization through the numerical simulation of proton, neutron and gamma transport by Monte Carlo method. It is proposed to apply composite moderator made of magnesium fluoride and aluminum fluoride, composite reflector of graphite and lead and to use 2.3 MeV proton beam. New method for determining the absorbed dose is described and discussed also.

Reference List

[1] W. Sauerwein, A. Wittig, R. Moss, Y. Nakagawa *Neutron capture therapy: Principles and applications* // Eds.:. Springer. 533 p. (2012).

[2] S. Taskaev Accelerator based neutron source // *Physics of Particles and Nuclei* 46(6) P. 956–990 (2015).