

Physics 2

Development of VITA-III neutron source for BNCT clinic

Ya. Kolesnikov^{1,2}, T. Bykov^{1,2}, A. Koshkarev^{1,2}, I. Shchudlo^{1,2}, A. Soldatov^{1,2}, E. Sokolova^{1,2}, S. Savinov^{1,2}, S. Taskaev^{1,2}

¹Budker Institute of Nuclear Physics, Novosibirsk, Russia.

²Novosibirsk State University, Novosibirsk, Russia

Accelerator based neutron source VITA proposed, developed and actively used in Budker Institute of Nuclear Physics for investigations in the field of BNCT, cross-sections measurement and others.

VITA-II α (NeuPex) and VITA-II β are modified VITA, created for the Xiamen Humanity Hospital (China) and for Blokhin National Medical Research Center of Oncology (Moscow, Russia). Differences from VITA are pre-acceleration system of 150 kV, volume ion source made by D-Pace (Canada), less height of accelerator, because ELV voltage source in VITA-II α combined with feedthrough insulator.

The experience of using these facilities allows us to propose a new generation of neutron accelerator source – VITA-III. We plan to use volume-type H⁻ ion source, compact gas stripper, cooled diaphragms of high-voltage electrode, seven accelerator gaps instead of six, pre-deceleration of H⁻ beam and compact rotating thin lithium target. While concepts of volume-type H⁻ ion source, compact gas stripper, cooled diaphragms of high-voltage electrode and pre-deceleration of H⁻ beam^[1] are approved by series of experiments, we have to approve seven accelerator gaps and rotating target concepts soon.

The report describe results of experiments conducted. We hope VITA-III will be reliable, compact and cheap facility to use it in clinical practice.

Keywords: AB-BNCT; VITA; High-voltage power supply

References:

- [1] T. Bykov, Ya. Kolesnikov, A. Koshkarev et al. Comparison of vacuum insulated tandem accelerators and suggestions for its improvement. Nuclear instruments and Methods in Physics research. A 1077 (2025) 170587.