neutron source

Cockcroft-Walton generator for powering a vacuum-insulated tandem accelerator

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The accelerator neutron source VITA based on a vacuum insulated tandem accelerator operates at the Budker Institute of Nuclear Physics. At the accelerator source, when transporting a powerful (up to 10 kW/cm^2) beam of protons or deuterons to the target, neutrons with a wide range of energies are generated: cold, thermal, epithermal and fast. The transported beam or neutron flux is used for conducting research in the field of boron-neutron capture therapy, measuring the cross section of nuclear reactions (^{7}*Li(p,p'ɣ)*^{7}*Li*, ^{7}*Li(p,α)*^{4}*He*, ^{6}*Li(d,α)α,* ^{7}*Li(d,α)*^{5}*He,* ^{6}*Li(d,p)*^{7}*Li* ^{7}*Li(d,α)αn*), conducting materials science research together with INP, CERN, ITER and other applications.

The creation of a Cockcroft-Walton generator to power vacuum insulated tandem accelerator and their separation to a new neutron source is an urgent task, this will allow the treatment of malignant tumors by fast neutrons and radiation testing of promising materials. The generation of fast neutrons on an existing accelerator neutron source is complicated by the fact that a source of negative hydrogen ions and a bending magnet were calculated and produced for the generation and transportation of a proton beam. The installation being created will be designed to generate and conduct a deuteron beam, while the high-voltage and intermediate electrodes of the accelerator will be connected directly to the corresponding sections of the high-voltage power supply [1].

This study presents the concept of a powerful compact accelerator source of fast neutrons being developed; the results of numerical calculations, modeling and preliminary testing of the accelerator power source in air are presented and summarized; further steps of manufacturing and testing of the proposed power source are formulated.

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References:
1. S. Taskaev, I. Sorokin. Vacuum-insulated tandem accelerator. Patent for invention № 2653840, 15.05.2018.