Upgrades of a vacuum insulated tandem accelerator for obtaining requirement voltage without breakdowns

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Epithermal neutron source based on an electrostatic tandem accelerator of a new type - Vacuum Insulation Tandem Accelerator, and lithium neutron target has been proposed and developed at BINP [1] for Boron Neutron Capture Therapy [2] - promising method for treatment of tumors. 2 MeV proton beam was obtained in the accelerator, the neutron generation carried out with bombardment of a lithium target by protons, successful experiments on irradiation of cell cultures incubated in boron medium have been carried out [3], human glioblastoma grafted mice were cured [4]. It is necessary to increase proton energy from 2 to 2.3 MeV [5] to form a neutron beam suitable for the treatment of deep-seated tumors. To do this, it is necessary to provide the high-voltage strength of the accelerator at the potential of 1.2 MV in order to suppress dark currents to an acceptably small value. Two upgrades to obtain the required potential were consistently implemented. At first, the glass rings of the feedthrough insulator were replaced by ceramic ones doubled in height which made it possible to refuse placing the resistive divider inside. Then the smooth ceramic rings were replaced by the new ceramic rings with a ribbed outer surface. Modernization made it possible to obtain the required voltage of 1.15 MV and the proton beam current of 9 mA in the accelerator without breakdowns. The report describes in detail the modernizations carried out, presents the results of the studies, and declares the research plans.

References:

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The study was supported by the Russian Science Foundation (project No. 19-72-30005) and by the Budker Institute of Nuclear Physics.