strength in the vacuum gap and limiting of the proton beam current. Suppression of the ion flux of the stripping gas is proposed using a transverse magnetic field applied in the region between the stripping target and the apertures in the high-voltage electrode. The paper presents the results of measurements of the ion beam current at the output of the accelerator depending on the argon pressure. Also the scanning electron microscope observations of the diaphragm surface modified by accelerated argon ions, and the results of direct measurements of the specially installed argon ion current detector are presented. The paper presents and discusses the project of modified gas stripping target. The idea of the target modification is the following. Inside the high-voltage electrode just behind inlet aperture it is proposed to apply 1 T transverse magnetic field using two-pole permanent magnets. In this field a parallel shift of the injected beam of negative hydrogen ions is performed. Similar magnets at the exit of the stripping target return proton beam back to the axis of accelerator channel. In this geometry not only significant suppression of ion penetration of the stripping gas into the accelerating channel can be achieved, but also a significant improvement of vacuum conditions in the accelerating channel and reduction of the ultraviolet radiation from the plasma in the stripping target. It is enough to shift the stripping target to a distance greater than the aperture (20 mm) in the high-voltage electrode and to implement a differential gas pumping. The paper presents results of trajectory calculation of the injected ion beam, evaluation of its emittance increase because of the magnetic field penetration into the stripping tube and selection of the optimal solution. The geometry of the magnetic system and the system of differential gas pumping using turbomolecular pump installed inside the high-voltage electrode are presented. The work plan for the stripping target modification and increasing the proton beam current is discussed.

PS2 P 15

A new concept of a Vacuum Insulation Tandem Accelerator

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Tandem accelerator with vacuum insulation has been proposed and developed in Budker Institute of Nuclear Physics. Negative hydrogen ions are accelerated by the positive 1 MV potential of the high-voltage electrode, converted into protons in the gas stripping target inside the electrode, and then protons are accelerated again by the same potential. Potential for high voltage and intermediate electrodes are supplied from the sectioned rectifier of electron accelerator ELV produced by the Institute for a long time, through sectioned feedthrough insulator with a resistive divider. In this work, we propose a radical improvement of the accelerator concept. It is proposed to abandon the separate placement of the accelerator and the power supply and connecting them through the feedthrough insulator. It is proposed to locate the source of high voltage inside the accelerator insulator, high voltage and intermediate electrodes mounted on it. This will reduce the facility height from 7 to 3 m and make it really compact and attractive for placing in a clinic. This will also significantly increase the stability of the accelerator, because the potential for intermediate electrodes can be fed directly from the relevant sections of the rectifier. The paper presents and discusses technical solution for making compact sectioned rectifier, scheme of its placement inside the insulator, and the benefits of this proposal.