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INCREASING THE ELECTRICAL STRENGTH OF THE ACCELERATING SYSTEM OF A SMALL-SIZED ION ACCELERATOR

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When developing small-sized linear accelerators, the design of which includes the Penning ion source and the accelerating system [1, 2], special attention is paid to the device electrical strength. Its decrease is mainly due to the fact that "secondary" processes occur in the accelerator's accelerating system when a negative voltage is applied to the accelerating electrode. One of them is the deposition of the accelerating system insulator inner surface by the products of the ion beam interaction with accelerating system electrodes [3]. In this case, a conductive layer is formed on insulator inner surface. It contributes to the insulator surface breakdown [3]. Another process is the electron emission from the accelerating system areas with an increased local electric field strength: "triple" junctions [4], the negative electrode edges, having a small radius of curvature. The avalanche-like movement of electrons emitted from the "triple" junctions also leads to a decrease in the electrical strength of the accelerator's accelerating system.

This work is devoted to the study of the effect of insulator inner surface deposition on the accelerating system electrical strength, as well as "triple" junctions and negative electrodes edges having a small radius of curvature. To do this, first, a trajectory analysis was carried out in the accelerating system to identify the causes of deposition formation [5]. After that, calculations of electric fields in the accelerating system were performed, which made it possible to identify areas with a local increase in the electric field strength (Fig. 1).

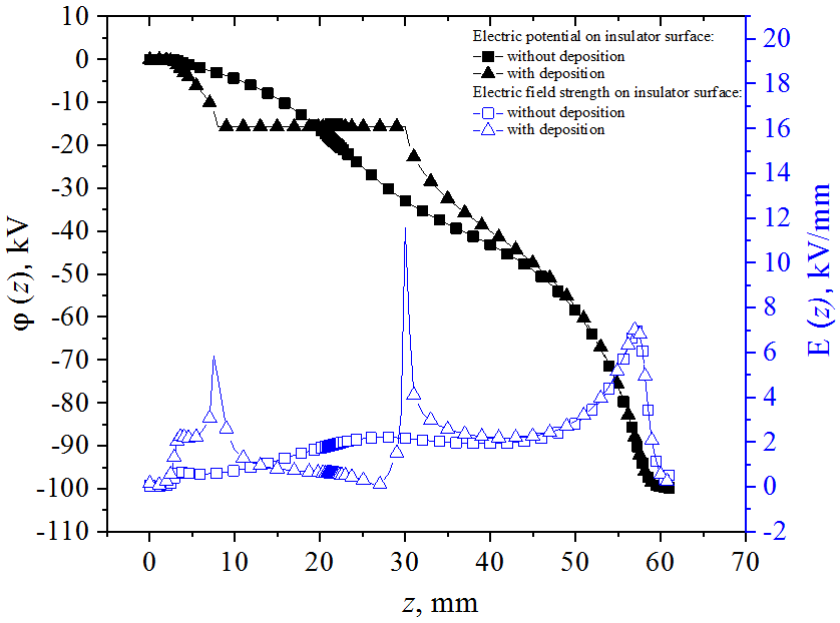

Fig. 1. The potential and the electric field strength modulus dependences near the insulator inner surface in the absence and presence of deposition

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