

## SIMULATION OF THE ION BEAM MOVEMENT & ELECTRODES SPUTTERING IN MINIATURE LINEAR ACCELERATOR

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Miniature linear accelerators (MLA) are widely applied in various fields of science and technology [1,2]. Traditional MLA consists of a Penning ion source (PIS), an ion-optical system (IOS) and a neutron-generating target. One of the main reasons for failure of MLA is the decrease in the electric strength of the high-voltage insulator. During prolonged operation deposition metal layer on high-voltage insulator inner surface is formed due to IOS electrodes sputtering. When a certain critical thickness of the conductive metal layer is formed on the insulator between the accelerating electrode and the focusing electrodes, a high-voltage breakdown is provoked [3].

In this paper, the main sources of deposited particles are identified using three steps of numerical simulations:

1. ion beam trajectory analysis in Comsol Multiphysics [4],
2. simulations of surface sputtering by BCA codes SRIM [5], SDTrimSP [6], and SCATTER [7,8]
3. sputtered particles trajectory analysis in Comsol Multiphysics.

To determine the electrode sputtering areas, additional processes of ion beam interaction with the residual gas during its transportation to the IOS was considered. Simulation results were compared with experimental dates. Experimental data were obtained by digitizing MLA photos which were taken during operation by usage of the ImageJ software [9].

### REFERENCES

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