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STUDY OF HIGH-CURRENT RELATIVISTIC ELECTRON BEAM INTERACTION WITH TANTALUM TARGET *)

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Recently, linear induction electron accelerators with an energy of about 20 MeV and capable of producing several pulses have been widely developed, [1, 2]. A substantial feature of such accelerators is the problem of focusing the beam on a target converter with a high atomic number. When a focused electron beam interacts with a target in the first pulse, its intense demolishing occurs, accompanied by plasma formation, hydrodynamic expansion of the target substance, which affects the beam in subsequent accelerator pulses [3]. This report presents the results of a study of the interaction of a beam with a target on an accelerator operating in a two-pulse mode with an accelerating voltage of 18 MV, a beam current of 1.5 kA and a pulse duration of 150 ns. Spacing between the pulses was varied from 3 to 10 microseconds. To observe the beam focusing dynamics, a segmented detector based on a scintillation fiber [4] with an improved time resolution of 4 ns per frame was used. The integral beam focusing spot was recorded on a BGO crystal plate (attenuation time ~ 300 ns). The lateral projection of matter hydrodynamic expansion from the target was photographed with four cameras with an exposure time of up to 1 microsecond. Targets in the form of tantalum plates with a thickness of 1 to 3 mm were studied. It is shown that the focused beam evolves on the target in both the first and second accelerator pulses. This indicates the influence of the expanding gas-plasma cloud from the target on the beam focusing. This is also confirmed by the typical pattern of the target dissembling in the lateral projection.

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