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Feasibility Study of High Intensity Lithium Beam Production for Directional Pulsed Neutron Flux Generation

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A compact accelerator-driven neutron generator with a lithium beam driver can generate neutrons in a forward direction, even using incident beam energy at a near-threshold energy. Especially for medical and industrial applications, the ability to suppress unwanted radiation to patients is a major advantage. However, it is difficult to supply a high-intensity lithium-ion beam, and its practical application has been considered impossible. Therefore, to solve the most important issue, the lack of ion flux, a direct plasma injection method was adopted. In this method, pulsed high-density plasma from a metallic lithium foil generated by laser ablation is efficiently injected and accelerated by a radio-frequency quadrupole linear accelerator (RFQ linac). As a result, a peak beam current of 35 mA, which is higher than that of conventional ion sources, can be obtained. This demonstrated the feasibility of constructing a neutron generator using inverse kinematics scenario.

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