Current status of the study of aneutronic proton–boron fusion in a nanosecond vacuum discharge

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Earlier, the experiment and PiC simulations revealed the possibility of confining and accelerating ions to energies of tens of keV by the field of a virtual cathode in the nanosecond vacuum discharge (NVD), and both DD neutrons and α particles from the neutronless reaction proton-boron (pB) were obtained experimentally [1, 2]. This report presents and discusses new data on α particle output from pB reaction, registered in a resumed NVD experiment. Overall, the yield of α particle has increased compared to the first experiments [1] and confirms the trend also in increasing pB reaction output with increasing virtual cathode radius, previously obtained by PiC simulations [3]. A simple analytical model for scaling the pB reaction yield over the anode volume in a NVD, where neutronless fusion processes occur, is developed. For a fixed potential well length, the pB reaction yield in an oscillating NVD plasma is proportional only to the anode radius, not its volume, as would be the case in a homogeneous plasma. The specifics of proton–boron fusion processes in various electrode geometries are discussed also.

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[2] Kurilenkov Yu K, Tarakanov V P, Oginov A V, Gus'kov S Yu and Samoylov I S 2023 *Las.&Part. Beams* **2023** 9563197
[3] Kurilenkov Yu K and Andreev S N 2024 *Front. Phys. (Fus.Plas.Phys.)* **12** 1440040