ON SCALING OF ANEUTRONIC PROTON-BORON FUSION POWER IN A NANOSECOND VACUUM DISCHARGE

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Earlier, the experiment and PiC simulations recognized the possibility of confining and accelerating of ions to energies of tens of keV by the field of a virtual cathode in an inertial electrostatic confinement scheme with reverse polarity. This scheme was implemented on the basis of a miniature nanosecond vacuum discharge (NVD) of low energy, where both DD neutrons and alpha particles from the aneutronic proton-boron reaction [1] were registered experimentally. In the present work, in search of the ways for optimizing of proton â€" boron (pB) fusion in NVD, we study the scaling of pB fusion power depending on the size of the virtual cathode (or the inner radius of the anode space). In fact, the favorable scaling of the DD fusion power, which increases with the inverse of virtual cathode (VC) radius, was obtained for oscillating plasmas earlier [2–4], and stimulates this study also. The present results of the PiC simulations by KARAT code [5] show that the number of the proton-boron reactions at anode space of NVD increases with the anode volume grow, and the α particles output turns out to be proportional to the value of anode radius (and VC radius also) in the range $R_A \approx 0.1$–0.5 cm. However, the number of proton-boron reactions reaches some saturation with RA growing under the fixed time of high voltage applied and value of the energy input [6]. In general, the formation of a more voluminous potential well (wider in radius and extended along the discharge axis), with wellâ€"defined oscillations of protons and boron ions in it, provides a noticeable increase in the output of α particles. The PiC data obtained are involved now into the preparation of the next stage of experiment on pB fusion in NVD.

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