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Using the DC self-bias effect for simultaneous ion-electron beam generation in space thruster applications[1] DMYTRO RAFALSKYI, ANE AANESLAND, Laboratoire de Physique des Plasmas (CNRS, Ecole Polytechnique, Sorbonne Universités, UPMC Univ Paris 06, Univ Paris-Sud), Ecole Polytechnique — In this work we discuss ways to use the self-bias effect for broad ion-electron beam generation and present recent experimental results. In asymmetrical systems the self-bias effect leads to rectification of the applied RF voltage to a DC voltage dropped across the space charge sheath near to the electrode having smaller area. Thus, continuous ion acceleration is possible towards the smaller electrode with periodical electron extraction due to the RF plasma potential oscillations. We propose a new concept of neutralizer-free gridded space thruster called NEPTUNE. In this concept, the RF electrodes in contact with the plasma are replaced by a two-grid system such that "the smaller electrode" is now the external grid. The grids are biased with RF power across a capacitor. This allows to locate RF space charge sheath between the acceleration grids while still keeping the possibility of a DC self-bias generation. Here we present first proof-of-concept of the NEPTUNE thruster prototype and give basic parameters spacing for such thruster. Comparison of the main parameters of the beam generated using RF and a classical "DC with neutralizer" acceleration method shows several advantages of the NEPTUNE concept.

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