2d-hybrid model for plasma accelerator with open walls and closed electron drift

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The original approach to use Hall-type plasma accelerators with closed electron drift and open walls for production converging towards axis accelerating ion beam describes here. The model in which a generalization condition of self-sustained discharge in crossed ExH fields with taking into consideration both electron and ion dynamic peculiarity is obtained is created. Two-dimensional hybrid model (in cylindrical coordinate r-z) for accelerator was created for which a kinetic approximation was used for ions and neutral description and a hydrodynamic – for electrons description. The performed computer modeling showed that in high-current mode the ions moving toward the system center and then along the axis in both directions. In the center of system they are able to create space charge which can be used for negative charge particle beam control. The simulation results show that potential drop along the axis arises which can be used for ion beam accelerating. The calculation results are in good agreement with obtained experimental data.

Note that the presented plasma device is attractive for many different high-tech practical applications, for example, like plasma lens with positive space cloud for focusing negative intense charge particles beams (electrons and negative ions) and for potential devises small rocket engines.