

Research of the Rotation Magnetic Field Current Driven Effect on Pulsed Plasmoid Acceleration of Electric Propulsion

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Abstract : The field reversed closed magnetic field configuration plasmoid has a potential for large thrust and high power propulsion missions such as deep space exploration due to its high plasma density and larger azimuthal current, which will be a most competitive program for the next generation electric propulsion technology. Moreover, without the electrodes, it also has a long lifetime. Thus, the research on this electric propulsion technology is quite necessary. The plasmoid will be formatted and accelerated by applying a rotation magnetic field (RMF) method. And, the essence of this technology lies on the generation of the azimuthal electron currents driven by RMF. Therefore, the effect of RMF current on the plasmoid acceleration efficiency is a concerned problem. In the paper, the influences of the penetration process of RMF in plasma, the relations of frequency and amplitude of input RF power with current strength and the RMF antenna configuration on the plasmoid acceleration efficiency will be given by a two-fluid numerical simulation method. The results show that the radio-frequency and input power have remarkable influence on the formation and acceleration of plasmoid. These results will provide useful advice for the development, and optimized designing of field reversed configuration plasmoid thruster.

Keywords : rotation magnetic field, current driven, plasma penetration, electric propulsion

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