

Numerical study of electric field penetration into magnetized plasmas for a development of electrodeless plasma thruster

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We have examined ponderomotive acceleration for the development of electrodeless plasma thruster as a part of the HEAT (Helicon Electrodeless Advanced Thrusters) project. When a localized transverse electromagnetic field near ion cyclotron frequency is considered in the plasma region, the ponderomotive force becomes uni-directional in a divergent magnetic field, so that the ion can obtain net energy as it passes through the potential. For the efficient acceleration of the ion, the external electric field near ion cyclotron frequency should penetrate into the magnetized plasmas. In this presentation, we perform electromagnetic PIC simulation by the use of the VORPAL code (Tech-X corp.), and discuss the external electric field penetration near ion cyclotron frequency into the magnetized plasmas. We will elucidate the physical process of the electric field penetration and its influence on the ponderomotive acceleration.

Keywords: electric thruster, plasma acceleration, electrodeless electric thruster, ponderomotive force, electric field penetration