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Particle acceleration by external electromagnetic field for the next generation electric thrusters

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We have examined particle acceleration by ponderomotive force in divergent magnetic field by test particle simulations, and applied this concept to the next generation electric thrusters, as a part of the HEAT (Helicon Electrodeless Advanced Thrusters) project. In this configuration, two acceleration processes coexist: the ponderomotive acceleration, which is the parallel acceleration of ions along the background magnetic field, and the ion cyclotron resonance, which basically is the perpendicular ion heating followed by energy conversion from the perpendicular to the parallel directions by the mirroring effect. The former is preferable for the electric thrusters since the enthalpy production is less (pure acceleration) and also since the particle wall interaction is less pronounced. In this presentation we show the results of a parametric survey to compare the efficiency of the two processes by varying the external electromagnetic field and the background field parameters. The collision effect with neutral particle and the shielding effect due to the plasma will be mentioned as well.

Keywords: particle acceleration, electric thruster, electrodeless thruster