

Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Verification of the Coupling Oscillation in a Hall Thruster HANS

PFISTER, KRISTINA GAFF, SEAN BRANNON, Dickinson College — Plasma thrusters have found increasing application for station keeping of Earth-orbiting satellites and interplanetary missions, yet a few basic plasma physics questions of these thrusters remain unresolved. Recently, we discovered an oscillatory interaction between the discharge current and the current for the radial magnetic field in Dickinson College's closed drift Hall thruster. Similar oscillations were found and reported for the first time by Yu et al. [Plasma Sources Sci. Technol. 16, Sept. 2007], who refer to this interaction as a "coupling oscillation." In this phenomenon, azimuthally $E \times B$ -drifting electrons create a Hall current, which produces a magnetic field opposing the thruster's applied radial magnetic field. The reduction of this crucial radial magnetic field leads to a diminished discharge current and thus Hall current. As a consequence the "normal" radial magnetic field and increased discharge current return, causing the coupled cycle to begin again, thereby producing the oscillatory interaction we observe. Here we present evidence that verifies the connection between the discharge current and the current for the thruster's magnetic field.

Hans Pfister
Dickinson College

Date submitted: 11 Sep 2008

Electronic form version 1.4