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Time Synchronized Optical Diagnostics of a Diverging Cusped Field Ion Accelerator NATALIA MACDONALD, KEITH LOEBNER, MARK CAPPELLI, Stanford University — The Diverging Cusped Field Thruster (DCFT) - a plasma discharge ion accelerator, is an innovative alternative to a conventional low-power Hall Thruster. The DCFT employs permanent magnets of alternating polarity to create a cusped magnetic field profile that mitigates the transport of high energy ions toward channel walls, thereby reducing the effects of erosion. This discharge tends to operate in two modes: a low-current, quiescent mode, and a high-current mode characterized by strong periodic oscillations in the discharge current. While time-averaged diagnostics are adequate for the low-current mode of operation, diagnostic intervals longer that the period of the discharge oscillations prevent them from resolving the dynamics seen in the high-current mode. We report on the development of spectroscopic emission and laser-induced fluorescence (Doppler-based) velocimetry that is synchronized in time to the periodic discharge current. This diagnostic is not unique to these thrusters, and may be useful in the studies of other quasi-periodic plasma devices.

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