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Thruster-spoke dynamics interpreted in terms of periodic nonlinear driven phenomena MARK KOEPKE, West Virginia Univ — Signatures of entrainment, frequency and wavenumber pulling, excitation thresholds, and particle transport, associated with observed patterns of self-organizing dynamics of instabilities in EB plasma discharges, are being investigated in the archived data from the CHT experimental device at PPPL that had been temporarily moth-balled. The objective is to explain the spatio-temporal plasma behavior of the "spokes" that have been observed in modulated breathing oscillations in a cylindrical Hall-thruster plasma discharges using a combination of forced van der Pol oscillator equations, electrostatic gradient drift instabilities, the modified Simon-Hoh instability, and the influence of ionization instability. These signatures, yet to be fully explained, resemble those associated with limit-cycle behavior thoroughly characterized in other discharge plasmas and electronic nonlinear-oscillator circuits, so the anticipated goal is to validate an improved model of spoke frequency scaling with the pressure and magnetic field for Xenon and other gases. The long-range goal is to apply this validated model to other Hall thrusters and to a possible post-restoration experimental phase of the experimental device.

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