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Simulating dynamics modulation in a neon glow discharge plasma

P.M. MILLER, West Virginia University, H. GUNELL, Belgian Institute for Space Aeronomy, M.E. KOEPKE, West Virginia University — Dynamics modulation occurs when two ionization wave modes in a glow discharge plasma alternate as the dominant mode in response to a periodic driving force. This phenomenon has been observed experimentally in a neon discharge using a chopped beam from a narrow-band ring dye laser tuned to a wavelength near the metastable neon transition at 588.35 nm. In addition, an analytical periodic-pulling model has been described which includes a mode-amplitude normalization of the driving term which is consistent with the experimental data and provides a mechanism for the observed modulation. In this poster, we show that the experimentally-observed time series of luminosity oscillations can be reproduced by solving two coupled van der Pol equations using a Runge-Kutta routine with a driving term than can be renormalized when a mode change is detected. With appropriate parameter selections, the output is quantitatively comparable to the experimental result.

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