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Stationary Transverse Striations in Medium-Energy, High-Current Ion Beams

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Standing plasma striations are characterized by alternating regions of high and low luminosity observed in various plasma environments, including positive columns of DC discharges and microwave-generated plasma. In each case, the cause of said striations and the parameter space in which they exist vary. In recent tests at Oak Ridge National Laboratory (ORNL), stationary striations have been observed in medium-energy, high-current (i.e., 20-50 keV, >10 mA) ribbon ion beams produced in ORNL's ion source test stand [1]. These striations are aligned parallel to the beam direction—a phenomenon that, to our knowledge, has not been previously reported in literature.

To investigate the source and characteristics of these striations, a comprehensive study is conducted using argon and xenon plasma under a range of operating conditions. Spectroscopy and emittance diagnostic methods are employed to analyze the optical emission properties and phase space distributions of the generated ion beams. The results, including the sensitivity of striations to changing operating conditions, will be presented.

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References
[1] Wilson, E.J., Lopez, A., Clay, P., Stevenson, A., and Egle, B.J. (2023, October). "A 100 mA Metal Ion Source Test Stand."[Poster]. In the 76th Annual Gaseous Electronics Conference, Ann Arbor, MI.

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