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The University of Maryland Electron Ring Program

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The University of Maryland Electron Ring (UMER) is a unique machine that uses scaled electron beams at nonrelativistic energies (10 keV) to inexpensively model GeV beams of heavy ions over long path lengths (kilometers of transport distance). The UMER beam parameters correspond to space charge tune depressions, at injection, adjustable in the range of 0.14-0.8. Although a ring, many of the intense beam studies on UMER are applicable to linacs. This paper reviews the UMER program, which contains experimental, computational, and theoretical components. We outline the research areas of interest, recent accomplishments, and future plans, emphasizing the relevance to heavy ion drivers. Specific topics include longitudinal induction focusing and beam manipulations; generation and propagation of space charge waves, including large-amplitude solitons; bunch end interpenetration and observation of a multi-stream instability; beam halo studies; and diagnostic development.

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