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Commissioning of the University of Maryland Electron Ring (UMER)¹

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The University of Maryland Electron Ring (UMER) is a low-energy, high current recirculator for beam physics research. The ring is completed for multi-turn operation of beams over a broad range of intensities and initial conditions. UMER is an extremely versatile experimental platform with a beam current of up to 100 mA and pulse length as long as 100 ns. Beam current profiles are adjustable in both space and time. Intercepting and non-intercepting diagnostic equipment is in position every 20 degrees of the ring which allow time resolved measurements of position, beam current density, and emittance. UMER is addressing issues in beam physics with relevance to many applications that rely on intense beams of high quality. Examples are advanced accelerators, free electron lasers, spallation neutron sources, and future heavy-ion drivers for inertial fusion. We review the motivation, ring layout and operating conditions of UMER. The primary focus of this presentation will be the areas of beam physics that UMER is currently investigating, and others that are part of the commissioning plan. These topics include transverse beam dynamics (matching, halo formation, strongly asymmetric beams, space-charge waves, etc), longitudinal dynamics (bunch capture/shaping, evolution of energy spread, longitudinal space-charge waves, etc.), and computer simulation benchmarking and refinement. Future upgrades and planned research (acceleration and resonance traversal, modeling of galactic dynamics, etc.) will also be presented.

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