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Pulsed Power Facility Upgrades and Recent Experimental Research at the University of Michigan*

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The Plasma, Pulsed Power, and Microwave Laboratory at the University of Michigan (UM) is home to two large pulsed-power drivers, the Michigan Electron Long Beam Accelerator (MELBA) and the Michigan Accelerator for Inductive Z-pinch Experiments (MAIZE). MELBA is a Marx-Abramyan generator capable of generating a 10 kA electron beam at -1 MV for up to 1 µs; this accelerator is currently configured to produce -300 kV and is used for relativistic magnetron, high-power microwave (HPM) generator research. MAIZE is a 3-m-diameter, 40-brick, single-cavity Linear Transformer Driver (LTD) that supplies a fast electrical pulse (0–1 MA in 200 ns) for high energy-density physics (HEDP) research. UM is also constructing a third pulsed-power facility (BLUE) consisting of four, 1.25 m diameter, 10-brick LTD cavities. These four cavities were previously part of Sandia's 21-cavity Ursa Minor facility, and can be stacked together to increase load voltage.

Recent HPM developments include: a multi-frequency Recirculating Planar Magnetron (RPM) capable of simultaneous production of 1 and 2 GHz signals at the 10's of MW level, a Harmonic RPM utilizing a dualfrequency slow-wave structure to enable low-Q operation, and a novel crossed-field recirculating planar amplifier operating at ~13 dB gain at ~3 GHz.

Pulsed power and HEDP efforts include collaborations with Sandia National Labs on cylindrical foil experiments to investigate the formation and mitigation of the electrothermal and magneto Rayleigh-Taylor instabilities, development of an improved laser-entrance window for pressurized gas targets (such as MagLIF capsules), and development of deuterium pinch neutron sources. In support of these experiments, several diagnostics (multi-frame XUV camera, CW laser, visible and UV multi-frame laser backlighter, visible and UV spectroscopy, differential B-dot probes, high-current Rogowski coil) and driver upgrades (switches, capacitors, improved power feed) are being deployed.

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