A new MJ-class pulsed-power facility for HEDP experiments

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We describe a newly commissioned pulsed-power machine, “M3”, for driving high energy density physics experiments at First Light Fusion. 2.5 MJ of stored electrical energy is discharged in 2 us, generating currents of up to 14 MA into a low-inductance load. The primary purpose of M3 is to launch high velocity projectiles for driving shocks into targets.

The machine architecture consists of a 125 uF bipolar capacitor bank, with a maximum relative charge of 200 kV. The capacitors discharge via 92 multi-channel ball gap switches into 6 parallel plate transmission lines, which feed the current into the vacuum target chamber. Machine current is monitored with several in-fibre Faraday rotation probes.

The diagnostic suite consists of imaging and streaked VISAR, laser backlighting and self-emission imaging onto fast optical framing and streak cameras, and optical and IR pyrometry.

We also present data on initial M3 experiments that have been focussed on projectile launch techniques.