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5P05 - High-Energy Electric Gun for Exploding Foil Initiators

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Exploding Foil Initiators (EFI) are one method used to detonate secondary high-explosives without the use of sensitive, primary high-explosives. EFI's are typically driven by low-inductance, capacitor discharge units (a.k.a firesets or electric guns). Electric guns with stored energy of around 500-J and peak currents of 10's of kA are in common use to drive plastic-film flyers with areas of several mm^2 to the velocities required to determine energetic material detonation thresholds.
Anticipated experiments require much larger flyers (up to 2500-mm^2) driven to high-velocity and that will require much higher energy and current (100 kJ and 100's of kA).
To meet these requirements, we are developing a new, high-energy E-gun system based on repurposed Atlas capacitors and rail-gap switches. The new E-gun system is modular, and modules may be combined for increased capability. Each module stores up to 60-kJ at 60 kV and can deliver a current pulse of 500-kA in less than 2us.
To date, we have constructed three high-energy E-gun modules: one prototype and a two-module system designed specifically for operation at the LLNL HEAF facility. In this paper we will discuss the various design features and show test results.

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